# Danish Law on Controlling Emissions of Nutrients in the Baltic Sea Region

Baaner, Lasse; Anker, Helle Tegner

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Lasse Baaner & Helle Tegner Anker

# Danish Law on Controlling Emissions of Nutrients in the Baltic Sea Region

Country study report of the research project 'Legal Approaches to Controlling Emissions of Nutrients in the Baltic Sea Region – a Comparative Study of National Laws'. The research project is conducted for the Faculty of Law, Stockholm University 2012-2013.

**Abstract**

The Danish legal system for regulation of nutrients leaching from agriculture and wastewater facilities establishes a comprehensive set of measures in accordance with a number of national political agreements and action plans elaborated since the mid-80'ies. Although significant reduction of nutrient pollution has been achieved, the expected improvement of in particular the marine aquatic environment has not yet been achieved. New reduction targets have been established and additional measures are now being implemented as part of the river basin management process according to the Water Framework Directive.

**Keywords**
Denmark; Nitrates Directive; Water Framework Directive; eutrophication; agriculture; marine waters; environmental law; River Basin Management Planning; marine strategy; HELCOM; wastewater.

The author's affiliation and address:
Department of Food and Resource Economics
Faculty of SCIENCE
University of Copenhagen

www.ifro.ku.dk

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# Contents

# Introducing the Research Project

## Legal Approaches to Controlling Emissions of Nutrients in the Baltic Sea Region

In January 2012 a research project about legal approaches to controlling nutrient emissions to the Baltic was launched at the Faculty of Law of Stockholm University. The project was financed within the multidisciplinary programme BEAM (Baltic Eco-system Adaptive Management) at Stockholm University, headed by professor Jonas Ebbesson, and carried out by the post doc. researcher Annika K. Nilsson. This report is one of four country reports produced within this research project.

## The research project

The research comprises investigation of Swedish, Danish, Estonian, and Polish law, and comparative study of approaches and regulatory means for controlling nutrient emissions – specifically from agriculture and sewerage – in order to avoid eutrophication of the Baltic Sea. In the search for effective marine ecosystem management approaches that are sensitive and adaptive to relevant ecological functions and changes, it is important to learn from the collected experiences from eutrophication control. The aim is that comparative study of differences and similarities in national legal approaches will enrich our understanding of the legal system and provide new insights and ideas of how to improve the quality of relevant regulation.

## Analysing ecosystem adaptive management

The project takes its departure in ecosystem adaptive management theory. The legal order as a social structure for governance, realizing and supporting ecosystem management, should be sensitive and continuously adaptive to relevant ecological functions and change of sta-

tus. This perspective is also reflected in more recent international and regional law and policy, centrally under HELCOM and EU-law on water and marine environment. Under these legal strategies, environmental standards and levels of nutrient pollution input, and their reduction, have been or shall be formulated. The different countries implement national programmes, and specific measures to control the inputs from important sources of pollution. The management strategies and regulatory control of the actual input of nutrients vary in the different legal orders, thus taking different approaches to managing the same resources and abating a common problem. These different regulatory approaches are compared in the research project, and their ecosystem approach analysed.

The study relates to the countries' duties under international and EU law as well as the common regional strategies. The study has been limited to the regulation of water pollution, and focus on two main sources of nutrient pollution input: sewerage and agriculture.

## Comparative study of national laws

Early on in the project, cooperation was initiated with Danish, Estonian and Polish researchers based at the Universities of Copenhagen, Tartu and Gdansk. In the second half of 2012, this international research cooperation conducted countrywise legal studies, which were reported in individual country studies in 2013. The resulting reports are made available digitally at **http://www.su.se/ostersjocentrum/english/beam/legal-aspects-of-the-ecosystem-approach/country-studies** , as well as on the Stockholm Centre for Environmental Law and Policy (SMC) web page to provide opportunity for further use of the data by the project group members, and other researchers.This is one of these reports.

The country studies were carried out and reported in accordance to a common template, thus ensuring comparability of the reported data. Consequently, all country base studies will show the following contents:

**Chapter 1** provides an introduction to the national legal system, and the environmental problem from the national perspective. This introduction provides a context to the further study, and possibility for understanding differences and similarities.

**Chapter 2** shows how, when and where central international law is implemented in the national legal order. This links national regula-

tions to the relevant international law, and provides materials for structural comparison and assessment of the level and method of implementation. It also provides a guide for further and more functionally oriented investigations of the regulation of nutrient emissions control. The chapter covers BSAP and other HELCOM documents, the WFD, the MSD, the Nitrate Directive, and the Waste Water Directive, etc.

**In Chapter 3 and 4** of the study, the regulation of the sources of nutrients pollution chosen for this study are described. Together with **Chapter 5** on river basin management, these parts are central for the study. The purpose here is both to describe the regulatory system and to assess its potential for ecosystems approach, or lack thereof. First of all, the relevant regulatory order is to be described, including law on substantive standards and regulatory instruments for controlling compliance, and realizing the objectives and aims (which should have been mentioned above). The authors have been asked to note observations of legal and practical problems in such regulation, to not only describe "black letter law" but also "law in action".

**Chapters 3–5** importantly also present reflections and some analytical observations pertaining to the presence and the realization of ecosystems approach in the relevant areas of national environmental law and management. The authors have looked for four characteristics or indicators of ecosystems approach, and have been asked to comment on a series of matters:

- **Ecological standards in regulating agriculture**. How are such standards prescribed, monitored, enforced, etc.?
- **Adaptiveness**. Is regulation adaptive to the status of the ecological systems and how?
- **Stakeholders involvement**. Are stakeholders effectively involved in the regulatory procedure, and are the effects on different kinds of stakeholders considered?
- **Legal measures in response to poor ecological status.** Is regulation flexible, so as to intervene and adjust to observed poor ecological status or changed environmental circumstances? Can stakeholders trigger such flexibility?

The reports are concluded with a **closing Chapter 6** (for the Estonian report some added information about other relevant legal measures have been presented under Chapter 6, leaving concluding remarks for Chapter 7).

# 1 Introduction

## 1.1 Introduction

This report is compiled as part of a Swedish research project aimed at improving the management of the Baltic Sea ecosystem. The legal order provides a structure for governance, and the legal system should thus be sensitive and continuously adaptive to the ecosystem.

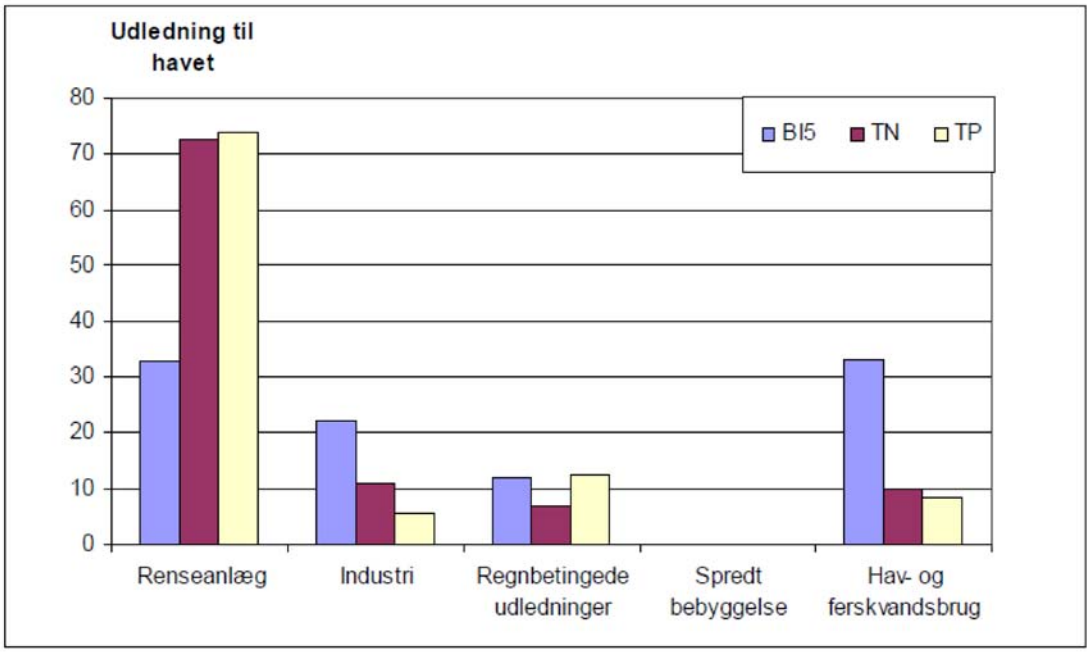
The management strategies and regulatory control of the actual input of nutrients vary in the different legal orders. This report describes the Danish regulation of water pollution and focuses on the two main sources of nutrient pollution input, namely sewerage and agriculture.

## 1.2 Nutrient Pollution in Denmark

Eutrophication effects have been documented in all Danish marine waters every year since the beginning of the 1980s.[1] The nitrogen influx into Danish marine waters originates from the surface areas and from deposition of airborne nitrogen as ammonia, mainly from agriculture, and nitrogen oxides, primarily from combustion and industrial activity. The main Danish sources are agriculture, households and industry.[2]

[1] Gunni Ærtebjerg, Jesper H Andersen, and Ole S Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 2003, 107.

[2] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport* (København: Natur- og Landbrugskommissionen, 2012), 318. For a comprehensive English introduction see Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*.




Source: Naturstyrelsen, *Punktkilder 2010*, 2011, 47.

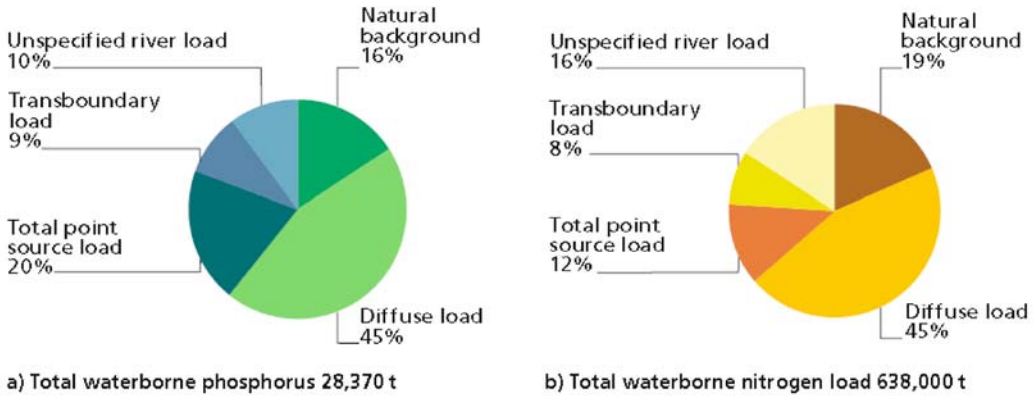
HELCOM has stated that the land-based contributions from Denmark to the Kattegat, the Belts and the western part of the Baltic Sea are almost half of the total direct terrestrial input. This should be seen in relation to the Danish basin representing one quarter of the total river basin area. The relatively large contribution from Denmark is due to the fact that a relatively larger proportion of Danish land is used for intensive agricultural production, compared to the other countries.[3]

If one also includes the nitrogen that is transported from foreign waters to Denmark by ocean currents, the picture looks different. The Danish contribution to the total amount of nitrogen is limited in this context. Additionally, there is a very large mix up with water from the Skagerrak and the non-Danish waters of the Baltic Sea with the Danish surface runoff.[4]

According to the Fifth Baltic Sea Pollution Load Compilation (PLC-5) from HELCOM, Denmark contributed with 52,000 tonnes of nitrogen and 1,520 tonnes of phosphorus in 2006.[5] For nitrogen, this amounts to 8.2 % of the total pollution load to the Baltic Sea, and for phosphorus 5.4 %. The main sources of direct nutrient discharge into the sea are municipal wastewater treatment plants, while agriculture

[3] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 319.
[4] Ibid.
[5] HELCOM, *Fifth Baltic Sea Pollution Load Compilation (PLC-5)*, *Baltic Sea Environment Proceedings*, 2011, 31.

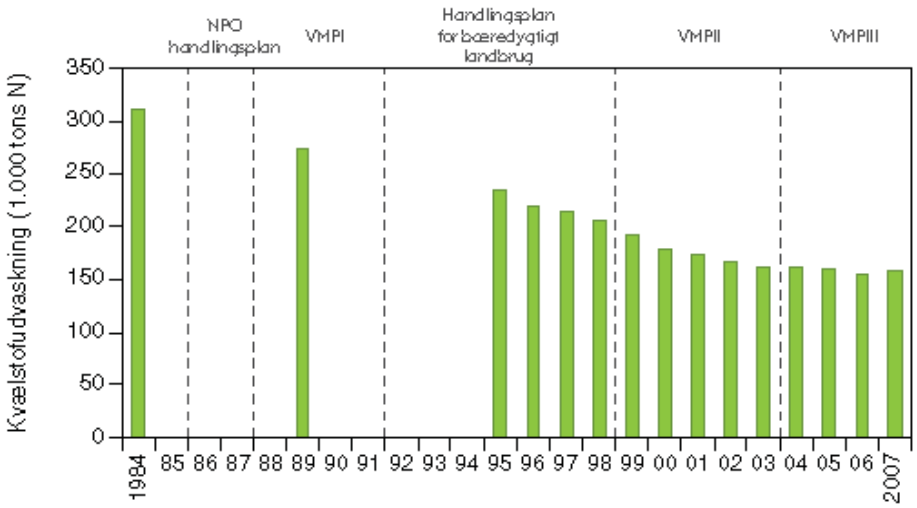
constitutes the largest share of the reported total diffuse load to the sea.[6]




Source: Fifth Baltic Sea Pollution Load Compilation (PLC-5), p 38.

The total waterborne nitrogen and phosphorus loads from Denmark to the Baltic Sea were significantly reduced during the 1994-2008 period when the HELCOM surveys were compiled.[7] Analysis shows that since 1990, the decrease in the overall nutrient load to the sea from Denmark is approximately 50%; the agricultural load alone is reduced approximately 40%.[8] Comparing with 1985 figures, it has been estimated that by 2003 the agricultural nitrogen load was reduced with 48% (from 311.000 tons to 162.000 tons in 2003) as a consequence of the Danish aquatic action plans (see also section 2.3.1).[9]

[6] Ibid., 38.
[7] Ibid., 7.
[8] Poul Nordemann Jensen et al., *Vandmiljø og Natur 2010: NOVANA. Tilstand og udvikling - faglig sammenfatning*, 2011, 15.
[9] Ruth Grant and Jesper Waagepetersen, *Vandmiljøplan II – Slutevaluering* (Danmarks Miljøundersøgelser, Miljøministeriet, 2003), 31.




Source: Ruth Grant et al., *Status for miljøeffekten af husdyrregulering og anden arealregulering*, 2010, 20.

Looking at wastewater treatment plans, the emissions decreased by just over 80%. However, taking climatic conditions into account, there have been no significant changes to the nitrogen load from point sources and agriculture to the aquatic environment after 2003.[10]

Eutrophication has been on the political agenda since the 1980s, where a general public and political awareness of the problem of oxygen depletion in fjords and coastal waters emerged. A comprehensive and updated overview of the Danish efforts to limit pollution of the aquatic environment is provided by the Baltic Compass Project Research.[11] Although phosphorus plays an important role, nitrogen is the main limiting factor for primary productivity in coastal and marine waters in Denmark. Agriculture is the major contributor of nitrogen pollution.[12]

The main policy documents for limiting eutrophication of the coastal waters including the Baltic Sea are the national political agreements formed as aquatic action plans. These plans are further described in detail in section 2.3.1 as they are closely linked to the implementation of the Nitrates Directive.

[10] Jensen et al., *Vandmiljø og Natur 2010: NOVANA. Tilstand og udvikling - faglig sammenfatning*, 6.
[11] Rasmus Klocker Larsen and Finn Pilgaard Vinter, *Implementability of agro-environmental targets in Denmark*, 2011.
[12] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 317–318.

The first action plan to reduce leaching of nitrogen, phosphorus and organic matters – the NPO Action Plan[13] – was launched in 1985 and followed by the Aquatic Action Plan I in 1987. The Aquatic Action Plan I stipulated a reduction target of 50 % for nitrogen and 80 % for phosphorus compared to the levels of the mid-1980s. Both action plans included a number of measures that were implemented by subsequent legislation. Owing to a delay in reaching the agreed-upon targets, a subsequent Action Plan for Sustainable Agriculture (1991) and Action Plan on the Aquatic Environment II (1998) provided further means for alleviating the problems.

The Aquatic Action Plan I aimed to reduce nitrogen emissions to surface water with 50% compared to the levels of the mid-1980s. This objective was not achieved within the stipulated deadline and was therefore maintained in the Aquatic Action Plan II of 1998, where a number of new instruments were proposed and subsequently implemented. The reduction objectives of the two action plans were estimated to be fulfilled in 2003,[14] however without the expected improvements to the aquatic environment. For this reason Action Plan III in 2004 stipulated a further reduction target of at least 13% of nitrogen leaching by 2015 (when compared to 2003). However, the midterm review of Action Plan III in 2008 showed no further decreases in the leaching of agricultural nitrogen between 2003 and 2007 despite the adoption of the planned measures.[15]

Action Plan III was partly related to the implementation of the EU Water Framework Directive. When starting the process of drafting the River Basin Management Plans in accordance with the Water Framework Directive, new reduction targets were identified in the so-called Green Growth Agreement (2009) as a reduction target of 19,000 tonnes of nitrogen at the national level together with a specification of the measures needed to achieve this target. In 2010, the reduction target was reduced, by the agreement Green Growth 2.0, to approximately 9,000 tonnes nitrogen for the first generation of River Basin Management Plans.[16] The remaining 10,000 tonnes of nitrogen reduction

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[13] Miljøstyrelsen, *Orientering fra Miljøstyrelsen nr. 4 1985 - NPO-handlingsplanen*, 1985.
[14] Grant and Waagepetersen, *Vandmiljøplan II – Slutevaluering*, 6.
[15] Jensen et al., *Vandmiljø og Natur 2010: NOVANA. Tilstand og udvikling - faglig sammenfatning*, 16.
[16] Regeringen; Dansk Folkeparti, *Aftale mellem Regeringen og Dansk Folkeparti om Grøn Vækst 2.0*, 2011. Naturstyrelsen, *Vandplan - Hovedvandopland Odense Fjord* (Naturstyrelsen, December 22, 2011), 34.

are presently heavily debated and awaiting political decisions prior to drawing up the second generation of River Basin Management Plans.

The national targets of an 80% reduction of phosphorus from sewage plants and industry to fresh and marine waters were achieved in 1996. The reductions of nitrogen discharges from sewage treatment plants have also been successful. The remaining problem still seems to be related to losses of nutrients from the agricultural sector.[17]

## 1.3 International Law

Denmark adheres to the so-called dualist approach indicating that international law is not as such a part of national law unless it has been explicitly incorporated into national legislation. Thus, international agreements cannot be directly applied by the courts or national authorities. However, Danish law should be interpreted in accordance with international obligations and there is a general presumption that Danish law should not contravene such obligations. Although international obligations are rarely called upon before the Danish courts, it is not unlikely that recommendations, e.g. regarding the level of pollutants, may be referred to in specific cases.

EU law takes a special position as supranational law in accordance with the transferral of sovereignty to the EU in the EU Treaties. As in other Member States, EU regulations are directly binding, whereas EU directives shall be transposed into national legislation. There are examples of EU directives being ascribed direct effect in particular within environmental law although the courts are rarely explicit in determining direct effect. An example could be the so-called beaver-case on the reintroduction of beavers where the Western High Court found that an appropriate assessment of the effects on a Natura 2000-site was not in accordance with Article 6(3) of the Habitats Directive.[18] The Nature and Environment Appeals Board has in several cases made direct references to not only the wording of EU directives, e.g. the Habitats Directive, but also to the interpretation of such directives by the Court of Justice of the European Union. Examples include appeal cases on permits for livestock installations. Thus, such permits have been heavily influenced by the strict criteria of the Habitats Di-

[17] Cf. also from 2003 Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 104.
[18] "Miljøretlige Afgørelser og Domme" (Karnov Group, n.d.), 1182 V.

rective as approximately 85 % of the Danish land area drains to (aquatic) Natura 2000 sites.[19]

It should be noted that international agreements to which the EU is a party become part of EU law and may be given direct effect even though the international obligations have not been transposed into EU or national legislation.

## 1.4 The National Legal Order

The Danish Constitution dating back to 1849 stipulates the distribution of powers between the legislative, executive and judicial institutions. Article 63 of the Constitution lays down the right of the courts to review administrative decisions.

The legislature is based on the concept of representative democracy. The Parliament has 179 members. Members of Parliament as well as members of the Government may propose new legislation. An act of legislation shall be read three times in Parliament prior to adoption. The second reading is normally assigned to the Parliaments Environmental Committee that covers e.g. environmental protection, nature protection, spatial planning, water management and marine strategies. At any time during the process, the committee or its members can pose questions to the minister on aspects relating to the environment. Prior to the presentation of a proposal for new legislation to Parliament, there is normally a public consultation on a draft proposal.

The acts usually mandate that the relevant minister pass statutory orders specifying or detailing the legislation. The formulation of the statutory orders is normally in the hands of civil servants in the respective ministries, and represents a freer form of regulation which can respond to shifting conditions and new knowledge or priorities, yet remains within the maneuvering space provided by the original law.

Denmark has a system of general courts: 24 district courts, two high courts and one Supreme Court.[20] There are no administrative courts in Denmark. However, administrative appeal boards have been

[19] See Skov- og Naturstyrelsen, 2006: Landbrug og Natura 2000.
[20] Homepage: www.domstol.dk.

established in different areas, e.g. the Nature and Environment Appeals Board.[21]

The Danish administration is divided between the relevant ministries, five regional councils and municipal councils in the 98 municipalities.

## 1.5 Environmental Law

There are no provisions in the Danish constitution regarding protection of the environment or ensuring an appropriate livelihood.

Danish environmental legislation is based upon a number of sectoral laws dealing with specific environmental issues – largely based upon the structure created in the early 70'es.[22] In a 1991 environmental law reform a number of smaller acts were merged into the three main pieces of legislation: The Act on Environmental Protection, The Act on Nature Protection, and The Act on Planning. These acts, however, are supplemented by a long list of other legislation, e.g. the Act on Watercourses, the Act on Water Supply, the Act on Polluted Soil, the Act on Chemicals, the Forest Act, the Act on National Parks, the Act on Environmental Damage, the Act on Environmental Assessment and the Act on Environmental Objectives. Environmental legislation in Denmark is thus characterized by a high level of complexity and the lack of a clear and coherent structure. In a 2011 report of an expert committee regarding the administrative appeal system, the complexity of environmental legislation was identified as one of the major obstacles to an efficient and well-functioning administrative appeal system.[23]

Polluting activities are in general regulated in the Environmental Protection Act through general prohibitions/restrictions and permit procedures. Environmental impact assessment procedures are, however, incorporated into the Act on Planning, whereas strategic environmental assessment procedures are governed by the Act on Environ-

[21] Homepage: www.nmkn.dk. For a further introduction to the role of courts etc. in Denmark (and other Nordic countries), see Helle Tegner Anker et al., "The Role of Courts in Environmental Law – a Nordic Comparative Study," *Nordic Environmental Law Journal* 1, no. 1 (2009): 9–33.

[22] See also Helle Tegner Anker, *Study on the Implementation of Article 9.3 and 9.4 of the Aarhus Convention - Denmark* (Frederiksberg, 2012).

[23] Ekspertudvalget vedrørende klagesystemet på natur- og miljøområdet, *Reform af klagesystemet på natur- og miljøområdet*, 2011.

mental Assessment. The Act on Planning establishes a decentralized spatial or land use planning system together with a general protection of the countryside through the so-called rural zone permit system for different activities. The Nature Protection Act includes a general protection of specific nature types and landscape elements, including a 300 m shore protection zone, as well as the possibility of establishing specific marine or land based conservation areas. The protection of Natura 2000 sites and Annex IV species of the EU Habitats Directive is embedded in the Statutory Order on Internationally Protected Nature Sites, in a notification and prohibition scheme under the Nature Protection Act and the Forest Act, and in a requirement of the Act on Environmental Objectives to draw up so-called Natura 2000-plans for each Natura 2000 site. The Act on Environmental Objectives also forms the basis for the elaboration of River Basin Management Plans in accordance with the EU Water Framework Directive.

Environmental administration primarily rests with the 98 municipalities, while the five regional councils only have limited responsibilities in relation to environmental legislation. This means that the municipalities are permit authorities in most cases, e.g. wastewater permits, permits for livestock installations and other environmental permits. Permits for larger industrial activities may, however, rest with the Ministry for the Environment.

At ministerial level, the Ministry for the Environment is responsible for the major part of environmental legislation. The Ministry for the Environment consists of a central administration including the Danish Nature Agency and the Environmental Protection Agency in Copenhagen and a number of local units. The Ministry of Food, Agricultural and Fisheries also has certain responsibilities in relation to environmental regulation of agriculture.

The Nature and Environment Appeals Board was established by the Act on Nature- and Environment Appeals Board on 1 January 2011 as a result of a merger between the former Nature Protection Appeals Board and the Environmental Protection Appeals Board. The Nature and Environment Appeals Board is organizationally part of the Ministry for the Environment, but it operates independently from instructions from the minister, cf. § 1 of the Act on Nature- and Environment Appeals Board. Most decisions made by the municipalities and most decisions made by the Ministry for the Environment can be appealed to the Nature and Environment Appeals Board.

The most important legislation in relation to the control of pollution of the Baltic Sea is the Environmental Protection Act, the Act on Fer-

tilizer Use and Plant Cover, and the Act on Environmental Permits for Livestock Installations. Furthermore, a new Act on Buffer zones along Streams and Lakes is foreseen to reduce the load of nutrients also to the sea, see further in Chapter 4.

## 1.6 Concluding and Summarising Remarks

The Danish legal system forms the basis for a detailed and to some extent also strict environmental regulation of nutrient pollution from agriculture and wastewater facilities. The political focus on nutrient pollution of surface as well as groundwater since the mid-80'ies has led to the adoption of several action plans stipulating reduction targets and establishing a set of measures to achieve those reduction targets.

The initial reduction target of 50% reduction of the nitrogen load from agriculture compared to the mid-80'ies was met in 2003. However, the expected improvements of the aquatic environment have not been achieved. New reduction targets have been established and additional measures are now being implemented as part of the implementation of the Water Framework Directive.

# 2 International and EU Law on the Control of Nutrient Emissions in Danish Law

## 2.1 Introduction

Eutrophication of the Danish parts of the Wadden Sea, along the west coast of Jutland and in open parts of Kattegat and the Baltic Sea is to a large extent caused by inputs from adjacent waters and deposition from the atmosphere. Nutrients are crossing borders and transported on long distances calling for international co-operation for an effective management.

A number of international initiatives have been adopted throughout the years:[24] The series of North Sea Conferences where the countries of the North Sea have adopted the goal of reducing nitrogen and phosphorus inputs by ca. 50%. The Oslo and Paris Conventions merged in the OSPAR Convention with a goal of achieving a healthy marine environment where eutrophication does not occur by 2010. Turning at HELCOM, a ministerial meeting in February 1988 similarly adopted the declaration with a 50% reduction target for discharges of nutrients over a 10-year period. In 1998, the ministers confirmed that they had committed themselves to attaining the strategic goal from 1988.

## 2.2 HELCOM

### 2.2.1 1992 Helsinki Convention

Denmark is a party to the Helsinki Convention and ratified the Convention in 1996. The implementation of the Helsinki Convention relies on existing legislation and there is no legislation adopted with the specific purpose of implementing the Convention. The relevant legislation primarily includes the Environmental Protection Act and the

[24] See Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 96–97.

Marine Environmental Protection Act. In relation to Annex III on the prevention of pollution from land-based sources, the measures to a large extent coincide with measures adopted as a result of EU obligations and the Danish aquatic action plans; for details on the relevant legislation, see section 4.3.

The Environmental Protection Act § 3 requires the use of BAT principles when issuing environmental permits. In the preparatory works, it is stated that the BAT principles do not imply the use of certain new technologies, but reflect the required emission limit values in the environmental permits and statutory orders.[25] This is also in accordance with the Industrial Emissions Directive which has recently led to a series of amendments of Danish legislation.[26] When dealing with activities that require an environmental permit, the authorities shall, according to § 19 of Statutory Order on Permits for Industrial Installations, ensure that the party responsible for the activity in question has taken the necessary measures to prevent and control pollution by using the best techniques available. In the use of this principle, due consideration may be given to the financial proportionality of the required measures.[27]

Emissions of nitrogen and phosphorus from discharge of wastewater is required to be reduced as much as possible using the best techniques available, and, if that is not adequate to meet the environmental objectives established for the body of water, stricter emission limit values must be applied according to § 13 of the Statutory Order on Environmental Quality Standards for Watercourses, Lakes, and Marine Waters in accordance with article 10 of the Water Framework Directive.

BAT requirements also apply when it comes to environmental permits for livestock installations, cf. Act on Environmental Permits for Livestock Installations § 1 and BAT is considered a key element.[28] For the purposes of BAT assessments, indicative BAT standard conditions have been issued primarily associated with the impact of ammonia from livestock farming.[29] These BAT standards are generally

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[25] Jørgen Bjerring and Gorm Møller, *Miljøbeskyttelsesloven af 1991 med kommentarer* (Jurist- og Økonomforbundets Forlag, 1998), 105.
[26] Forslag til Lov om ændring af lov om miljøbeskyttelse, lov om miljøgodkendelse m.v. af husdyrbrug, lov om jordforurening og forskellige andre love, 2011/1 LSF 88.
[27] Ibid., 107.
[28] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 358.
[29] E.g. Miljøstyrelsen, *Miljøstyrelsens BAT-blade: Køling af gyllen i svinestalde*, 2009.

based on a proportionality test, where costs from new technology are limited to 1 to 2 % of the total costs, and at the same time, must be less than DKK 100 per kilo of reduced ammonia emissions.

The current BAT standard terms were primarily introduced in 2010-2011. BAT conditions are mainly used in situations where farming systems are renovated or established. In order to ensure that BAT conditions actually yield the expected environmental effect, the Environmental Protection Agency has developed an indicative technology list. The Technology List is a list of environmental technology that has a documented environmental impact. The list is frequently updated following technological developments. This system is called the Environmental Protection Agency's verification system for eco-efficient technology, and the technology is assessed by the independent Expert Committee for Eco-efficient Agricultural Technology which determines whether a given technology can be recorded on the BAT list.[30]

### 2.2.2 Recommendation 24/3; Measures Aimed at the Reduction of Agricultural Emissions and Discharges

It has not been possible to identify any official statements from the government or Ministry of Environment that specifically addresses the implementation of recommendation 24/3 concerning reduction of agricultural emissions and discharges. A number of legislative initiatives have, however, supplemented previous initiatives to control nutrient emissions from agriculture, e.g. ammonia volatilisation and manure handling (see section 4.3).

Furthermore, it is generally stated in the adopted national River Basin Management Plans that they contribute to achieve the environmental objectives agreed upon in the HELCOM Baltic Sea Action Plan 2007 and the OSPAR strategy for reductions on phosphorus and nitrogen loads to the sea.[31] This is probably referring to the eutrophication segment of the HELCOM Baltic Sea Action Plan (see section 2.2.6), where a provisional reduction target for Denmark of 16 tonnes of phosphorus and 17,210 tonnes of nitrogen is agreed upon.[32]

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[30] See Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 490.

[31] E.g. Naturstyrelsen, *Vandplan 2012-2015 Østersøen. Hovedvandopland 2.6 Vanddistrikt Sjælland*, 2011, 11.

[32] HELCOM Extraordinary Ministerial Meeting, *HELCOM Baltic Sea Action Plan* (Krakow, 2007), 7.

As described in section 2.3.3, the first cycle of River Basin Management Plans is only supposed to achieve a reduction of 9,000 tonnes of nitrogen. When it comes to phosphorous, the expected reduction achieved by implementing the River Basin Management Plans is 120 tonnes, but this reduction is primarily established in order to achieve good status in the Danish lakes and not in order to reduce the pollution of coastal waters and the Baltic Sea.[33]

### 2.2.3 Recommendation 28E/6; On Site Wastewater Treatment of Single Homes and Rural Dwellings

The recommendation on wastewater treatment from sources outside urban wastewater collection systems such as single family homes, small businesses and settlements requires a certain reduction of phosphorus, nitrogen and organic matter in discharged wastewater.

The implementation of the recommendation is described in section 3.3. The Environmental Protection Act lays down general requirements and permit procedures regarding wastewater. In the River Basin Management Plans, rural areas are zoned by three treatment classes according to which the wastewater treatment from individual dwellings must comply. The three classes set requirements for the capacity of the chosen wastewater treatment system to nitrogen, organic matter and phosphorus, in accordance with the classes of Recommendation 28E/6. According to the Ministry of the Environment it is believed that Denmark meets the requirements,[34] and this also seems to be the case.

### 2.2.4 Recommendation 28E/5; Municipal Wastewater Treatment

This recommendation for the development of sewerage systems and treatment in municipal wastewater treatment plants includes requirements for the content of phosphorus, nitrogen and organic matter in the discharged wastewater. In accordance with the Environmental Protection Act, the environmental permits for wastewater treatment plants include the conditions with which the plant must comply and the quality standards for the discharged wastewater. The standards are deter-

[33] See e.g. Naturstyrelsen, *Vandplan 2012-2015 Østersøen. Hovedvandopland 2.6 Vanddistrikt Sjælland*, 32–33.

[34] Miljøministeren, "Miljøministerens svar på spørgsmål nr. 550 (alm. del) stillet af Folketingets Miljø- og Planlægningsudvalg", 2008.

mined on the basis of the Statutory Order on Wastewater Permits and the environmental status of the waters in question. Further, the environmental permits require that the plants account for the use of best available techniques, see section 3.2.

The Ministry of the Environment is of the opinion that Denmark complies with the recommendation.[35] This seems to be the case.

### 2.2.5 Recommendation 18/4; Managing Wetlands and Freshwater Ecosystems for Retention of Nutrients

Existing wetlands are generally protected by law in Denmark in accordance with the Nature Protection Act – either as part of the general protection of nature types/habitats in § 3 or on the basis of individual nature conservation orders cf. chapter 6 of the Nature Protection Act. This means that existing wetlands cannot be altered or reduced unless very special circumstances outweigh the nature protection interest.[36] Restoration and creation of new wetlands has been part of the aquatic action plans since the late 1980'ies and it is also an important element in the Danish River Basin Management Plans.[37] In addition reduced maintenance of watercourses has been introduced and a specific target of no or very limited vegetation management of 4,150 km watercourses is set out in the River Basin Management Plans, while another 1,000 km will be restored to their natural conditions.[38]

### 2.2.6 Baltic Sea Action Plan

The instruments for implementing the Baltic Sea Action Plan are the national River Basin Management Plans based on the political agreement Green Growth (see section 2.3.2), and adopted pursuant to the Water Framework Directive.[39] It is stated, in the River Basin Management Plans, that they must contribute to attaining the objectives of various international agreements, including the environmental objectives under the HELCOM Baltic Sea Action Plan 2007, and the limits for phosphorus and nitrogen loads to marine waters in the OSPAR

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[35] Ibid.

[36] Helle Tegner Anker, 'Naturbeskyttelseslovgivning', in *Miljøretten 2*, ed. by Ellen Margrethe Basse (København: Jurist- og Økonomforbundets Forlag, 2006), 417–556.

[37] See for further information (in Danish) www.vandprojekter.dk.

[38] Miljøministeriet Naturstyrelsen, "Karakteriseringen af vandløb og indsatsprogrammet på vandløbsområdet. Arbejdspapir fra Miljøministeriets arbejdsgruppe om vandløb" (Miljøministeriet, 2011), 20.

[39] Miljøministeriet, *Report on Denmark's implementation of the HELCOM Baltic Sea Action Plan. Case no. BLS-465-00129.*, 2010, 2.

strategy.[40] The wording is soft, and it is not clear whether the River Basin Management Plans are only supportive of the aim of fulfilling the plan. However, the opinion is that the estimated reduction of nitrogen and phosphorus loads that Denmark must attain to comply with HELCOM ecological objectives for the Kattegat, the Belts and Baltic Sea, exceed the reduction necessary for achieving the ecological objectives applied according to the Water Framework Directive.[41]

According to the Baltic Sea Action Plan, Denmark has been given a provisional total target for reducing discharge to the HELCOM areas in the territorial waters by 17,210 tonnes N and 16 tonnes P before 2021.

The Green Growth agreement, on which the new River Basin Management Plans are based, aims to reduce nitrogen inputs by 19,000 tonnes – of which the 10.000 tonnes are postponed to later planning cycles (see section 2.3.2) – and will thus effect a reduction of the water-borne load to the inner territorial waters (corresponding to the HELCOM region) of approx. 18,000 tonnes N.[42]

With regard to phosphorus, the Green Growth agreement lists initiatives to reduce discharges to the aquatic environment by 210 tonnes P, which foremost relate to lakes. However, the majority of measures envisaged to achieve a reduction in P inputs are general in character and are also expected to result in a reduction of P discharge to marine aquatic areas.[43]

Finally, the River Basin Management Plans refer to the OSPAR strategy limits for phosphorus and nitrogen loads to the sea. The aim of this strategy was that there should be no eutrophication as a result of human influence in 2010.[44] Regarding this issue, it is stated that the target has not been met as further reductions to nutrient loads are needed.

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[40] By- og Landskabsstyrelsen, *Retningslinjer for udarbejdelse af indsatsprogrammer. Version 5.0* (Miljøministeriet, 2011), 197; Naturstyrelsen, *Vandplan - Hovedvandopland Odense Fjord*, 11.

[41] Miljøministeriet, *Report on Denmark's implementation of the HELCOM Baltic Sea Action Plan. Case no. BLS-465-00129.*, 3.See also Naturstyrelsen, *Vandplan - Hovedvandopland Odense Fjord*, 185; By- og Landskabsstyrelsen, *Retningslinjer for udarbejdelse af indsatsprogrammer. Version 5.0*, 197.

[42] Miljøministeriet, *Report on Denmark's implementation of the HELCOM Baltic Sea Action Plan. Case no. BLS-465-00129.*, 3.

[43] Ibid.

[44] OSPAR Commission, *The North-East Atlantic Environment Strategy. Strategy of the OSPAR Commission for Protection of the Marine Environment of the North-East Atlantic 2010-2020*, 2010, 1–27 (p. 12).

The River Basin Management Plans as such are regulatory instruments directed at state and municipal authorities (see section 2.3.2). The plans for reducing eutrophication consist basically only of a few measures in addition to the existing regulation (see section 4.3). Those are:

- Tightening of the nitrogen norms for selected crops.
- Ban on cultivation tillage during certain periods.
- Extended use of catch crops.
- Cultivation-free buffer zones along rivers and streams.
- Reestablishment of wetlands.

The measures will generally be imposed through binding requirements in relevant legislation, including the establishment of buffer zones along streams and lakes. The establishment of wetlands is to some extent based on voluntary measures, although compulsory acquisition may be used.[45]

There have been no – or at least very limited – public debate addressing the implementation of the Baltic Sea Action Plan. However the River Basin Management Plans have been heavily debated, not only among farmers, environmentalists and their related organizations, but also among the public and in the media. A search on www.infomedia.dk shows that there have been almost 1,000 articles in national newspapers concerning the River Basin Management Plans during the last 10 years.

The River Basin Management Plans follow the schedule of the Water Framework Directive. However, due to political constraints, the plans are significantly delayed as described in section 2.3.3.

## 2.3 EU Law

The majority of Danish legislative measures within environmental law are related to the implementation of EU directives[46] – the legislation on the aquatic environment being no exception. Parts of the Danish legislation on controlling nutrients do, however, precede EU legislation including the Nitrates Directive. This may have led to the as-

[45] KL and Miljøministeriet, "Aftale om styringsmodeller for udmøntningen af vådområde- og ådalsindsatsen og om den øvrige indsats på vand- og naturområdet" (Miljøministeriet, 2009).
[46] Peter Pagh, *Lærebog i Miljørettens almindelige del* (Jurist- og Økonomforbundets Forlag, 2006), 81–118.

sumption that Danish legislation is ahead of EU legislation.[47] This, in particular, seems to be the case as regards the Nitrates Directive where national legislative initiatives have not necessarily been directly linked to the implementation of the Nitrates Directive, but rather to the implementation of national policy initiatives, i.e. the aquatic action plans.

The Danish implementation of the Nitrates Directive was criticized by the EU Commission in 1997 on the basis of a necessity to address regional aspects as well as to establish supplementary measures. This criticism was addressed by the Aquatic Action Plan II in 1998. Also in 2010 the EU Commission has raised some points regarding the Danish implementation of the Nitrates Directive, which have been addressed by the new Nitrate Action Programme 2008-2015.[48]

The Danish implementation of the Water Framework Directive has also been criticized by the EU Commission on both more general points regarding implementing legislation and the delayed adoption of the River Basin Management Plans (see section 2.3.3).

### 2.3.1 Nitrate Directive

National aquatic action plans have been the key political tools for reducing the load of nitrogen from diffuse pollution in the environment.[49] Although the national aquatic action plans to some extent precede the Nitrates Directive, the subsequent action plans have in practice been viewed as implementation of the Directive. The first political agreement – the NPO action plan – was agreed upon as early as in 1985, and the first agreement, named the Aquatic Action Plan, was adopted in 1987. The background was the heavily increased nutrient input into the Danish fjords and coastal waters, with the visible signs of oxygen depletion and the death of fish. Also, an increase in the nitrate content in ground and drinking water in many parts of the country called for political action. The Aquatic Action Plan I, as mentioned, sets a reduction target within three years of 50% for nitrogen

[47] For a critical assessment of Denmark's compliance see Peter Pagh, "Denmark's compliance with European Community environmental law," *Journal of Environmental Law,* (1999) 11(2): 301-319. Also Peter Pagh, "Tjaah, bum, bum ... - om gyldigheden af EU-miljøretten i dansk ret," in *Miljøretlige Emner. Festskrift til Ellen Margrethe Basse* (ed. Helle Tegner Anker and Birgitte Egelund Olsen; Kbh.: Jurist- og Økonomforbundets Forlag, 2008), 383–402.

[48] Miljøstyrelsen, *Danish Nitrate Action Programme 2008-2015*, 2012.

[49] They are well described in English in a number of documents and literature. Ibid. Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*; Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 88.

(49% for agriculture equivalent to a reduction from 260,000 tonnes pr. year to 127,000 tonnes pr. year) and a reduction target of 80 % for phosphorus (for agriculture only 9%, equivalent to a reduction from 4.400 tonnes pr. year to 4.000 tonnes pr. year).

The Aquatic Action Plan II of 1998 upheld the reduction targets of the first plan, and was seen – and also recognized by the European Commission – as an implementation of the Nitrates Directives provision on action plans. In addition to the Aquatic Action Plans, an Ammonia Action Plan was adopted in 2001.

When a midterm evaluation of the Aquatic Action Plan II in 2003 showed that the expected environmental effects were not achieved despite meeting the nitrogen reduction target, the Aquatic Action Plan III 2005-2015 was agreed upon in 2004.[50] This third aquatic action plan also including a stronger focus on the surplus phosphorus from Danish agriculture was in 2009 replaced by the so-called Green Growth Agreement.[51]

The Aquatic Action Plans and the Green Growth Agreement are best described as political agreements on targets and instruments.

The NPO Action Plan and the first Aquatic Action Plan included measures such as:[52]

- Technical requirements for manure storage
- Capacity requirements for manure storage
- Ban on spreading manure in certain autumn months.
- Ban on burning on the field of surplus straw.
- Requirement of environmental permits for larger farms.
- Requirements on the establishment of plant cover
- Requirements on mandatory fertilizer accounts
- Requirements on balance between livestock and farmland at farm level.
- Establishment of research into the connections between nutrients-loss and farming methods, techniques and structural development in the farming sector.
- Requirements for improved wastewater treatment from urban areas.
- Intent to reduce nitrogen in fuels.

[50] Regeringen, Dansk Folkeparti, and Kristendemokraterne, *Aftale om Vandmiljøplan III 2005-2015*, 2004.
[51] See section 2.3.3 and Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 23.
[52] Anker, H.T.: Miljøretlig regulering på landbrugsområdet, 1996 pp. 104-113.

The main legal instruments for implementing these measures were the Environmental Protection Act supplemented by a Statutory Order on Manure as well as a new Act on Fertilizer Use and Plant Cover.[53]

The second Aquatic Action Plan upheld the aims of the first Aquatic Action Plan – a 50% reduction in nutrient leaching compared to levels in the mid-1980s – and included the following measures that were subsequently laid down in legislation:[54]

- Improved enforcement of farming legislation
- A ban on treating straw with ammonia to improve its feed quality
- Reduction in the allowed fertilizer norms for cops – the N-norms.
- Further requirement to use catch crops in certain areas during winter
- Reduction in the number of livestock allowed per hectare of land.
- Increased accountability for nitrogen content when using manure.
- Subsidies for establishing wetlands
- Subsidies for organic farming
- Subsidies for reducing the use of fertilizer in environmentally sensitive areas.
- Subsidies for reforestation

The final evaluation of Aquatic Action Plan II, in 2003, concluded that the combined effects of aquatic plans showed a reduction in nitrogen leaching of approximately 48% of that of the mid-1980s, which was now estimated to be 230,000 tonnes of nitrogen. This result was close to the original target, and was considered to fall within the limits of the general uncertainty associated with the calculations.[55]

Despite the significant reduction, when compared to the extremely high levels of nutrients leaching to marine waters in the 1980s, the marine environment did not show the expected improvements. This led to the adoption of Aquatic Action Plan III in 2004, with the aim of reducing the leaching of nitrogen from agriculture by a further 13%, and phosphorus by 50% by 2015, when compared to the leaching in 2003.[56]

The third Aquatic Action Plan included the following measures:

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[53] Helle Tegner Anker, "Miljøregulering af landbrugets husdyrproduktion og tilhørende arealanvendelse," *Tidsskrift for Landbrugsret* 2 (2004).
[54] Regeringen, *Aftale vedrørende vandmiljøplan II*, 1998.
[55] Miljøministeriet Naturstyrelsen, *Retningslinjer for udarbejdelse af indsatsprogrammer 5.0. Bilag 2 - Beskyttede områder - Nitratdirektivet*, 2012, 3.
[56] Regeringen, *Vandmiljøplan III 2004* (Miljøministeiet; Ministeriet for Fødevarer, Landbrug og Fiskeri, 2004), 4.

- Subsidies for buffer zones along rivers and lakes, primarily to reduce the load of phosphorus. This measure aimed to affect 50,000 hectares, or around 2% of the farmed land.
- A general tax on phosphorus
- Zones of 300 meters around protected, nutrient-sensitive ecosystems where expansion of livestock farms should be limited. 180,000 hectares (7% of the farmland) would be affected by this.
- Limitation of the possibilities for expansion and establishment of livestock installations near residential areas in order to minimise adverse environmental impact including odour.
- Further research programmes focused on reducing odours from livestock, reducing phosphorus surpluses and emissions, improving methods for manure management, and supporting organic farming.

The midterm evaluation of Aquatic Action Plan III, in 2008, concluded that nitrogen leaching did not demonstrate a statistically significant reduction when compared to 2003. However, the phosphorus surplus was halved as expected. The conclusions were drawn: The implementation of the measures and their effects had not been as anticipated.[57]

With the aim of establishing a more comprehensive regulatory framework for the farming industry, as well as trying to meet the nitrogen targets of Aquatic Action Plan III and the requirements of the Water Framework Directive, in 2009 the Liberal-Conservative government and the Danish People's Party agreed to a new set of political initiatives and targets, titled 'Green Growth'. The content of the Green Growth agreement and the River Basin Management Planning will be elaborated in section 2.3.3.

The requirements of the Nitrates Directive are implemented in the national law by the Act on Fertilizer Use and Plant Cover, the Environmental Protection Act, the Act on Water Supply, Act on Environmental Permits for Livestock Installations, Statutory Order on Livestock, Manure and Silage, Statutory Order on Permits for Livestock Installations, and the Statutory Order on the Use of Fertilizer and Plant Cover.[58] The latter is reviewed on an annual basis. The annual review constitutes an adaptive element of the regulations, as further described in section 4.4. A comprehensive overview is presented in the recently published draft, 'Danish Action programme 2008-2015', according to the Nitrates Directive.[59]

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[57] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport.* Ibid., 324.
[58] See also Miljøstyrelsen, *Danish Nitrate Action Programme 2008-2015*, 13.
[59] Miljøstyrelsen, *Danish Nitrate Action Programme 2008-2015*.

There have been several revisions of the environmental regulation over the years, but the regulations have to a large extent followed the original framework established to implement the Nitrates Directive. The most recent amendment corrects the previous misinterpretation that only manure and not fertilizers in general were subject to the prohibitions of spreading during winter and in certain areas, cf. § 29 and 30 of the Statutory Order on Livestock, Manure and Silage.

In 2002 Denmark obtained derogation from the general limits of 170 kilos of nitrogen in manure per hectare in the Nitrates Directive. By this, a cattle farm may spread 230 kilos of nitrogen in manure per hectare if the fields are cultivated in a certain environmentally friendly manner. This exception has been extended since 2002. However, for pig farms, which cover a substantial part of Denmark's farmland, the limit in the Statutory Order on Manure and Silage is set at 140 kilos of nitrogen per hectare (see section 4.2).

When adopting the first Aquatic Action Plan in 1987, Denmark anticipated the 'whole territory' approach of the Nitrates Directive and adopted binding general legislation for the whole territory as described above.[60] The 'whole territory' approach was maintained after the adoption of the Nitrates Directive.

### 2.3.2 Wastewater Directive

The Urban Wastewater Directive has been transposed into Danish legislation since 1994, and has motivated a significant reduction in the discharges of phosphorous and nitrogen to the aquatic environment.

The various Aquatic Action Plan reduction targets for municipal wastewater treatment plants were set with reference to the directive, and resulted in a reduction of nitrogen from 18,000 tonnes N to ca. 6,600 tonnes and of phosphorus from 4,470 tonnes to 1,220 tonnes P.[61]

According to Article 5(8) of the directive, Denmark is exempted from the obligation to designate sensitive areas due to the fact that Denmark has chosen to implement the strict requirements for phos-

[60] Se e.g. Miljøministeriet Naturstyrelsen, *Retningslinjer for udarbejdelse af indsatsprogrammer 5.0. Bilag 2 - Beskyttede områder - Nitratdirektivet*, 2.
[61] Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 92.

phorus / nitrogen removal on all municipal wastewater treatment plants larger than 10,000 person equivalents.[62]

The main elements of the directive are implemented by Statutory Order on Wastewater Permissions and Statutory Order on Environmental Quality Standards for Watercourses, Lakes and Marine Waters. Denmark is believed to meet the requirements of the Directive.[63]

### 2.3.3 Water Framework Directive

The Water Framework Directive was transposed into Danish legislation by the 2003 Act on Environmental Objectives.

The Act on Environmental Objectives establishes that the State shall prepare River Basin Management Plans and Programmes of Measures that outline how the EU objectives of 'good status' for Danish waters are to be achieved. The River Basin Management Plans are regulatory instruments and comprehensive pieces of work, interacting with existing regulations and building on existing measures. They are the most significant parts of the implementation of the EU Water Framework Directive.

As previously noted, the River Basin Management Plans are now also the main framework for meeting the environmental objectives of the Nitrates Directives and to some extent the Marine Strategy Directive. The measures and actions included in the Programmes of Measures and River Basin Management Plans are seen as the tools for meeting the requirements of all three directives. However, while the River Basin Management Plans identify the necessary initiatives, the legal framework for adopting the necessary measures is embedded in other legislation, e.g. the Watercourse Act, the Act on Buffer Zones along Streams and Lakes and the Act on Fertilizer Use and Plant Cover.

The Green Growth Agreement of 2009 aims at establishing a green growth economy in which the agro-food sector improves its innovative and competitive potential and regains international market shares and agrees with the necessary measures to comply with the environmental objectives established according to the Water Framework Di-

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[62] See e.g. Naturstyrelsen, *Vandplan 2012-2015 Østersøen. Hovedvandopland 2.6 Vanddistrikt Sjælland*, 69, 196.

[63] Ministeriet for Fødevarer Landbrug og Fiskeri, *Det faglige grundlag for Vandmiljøplan III. Arbejdsgruppernes fælles afrapportering. Del 1* (Ministeriet for Fødevarer,Landbrug og Fiskeri,Departementet, 2003), 55; Miljøstyrelsen, *Muligheder for begrænsning af N og P udledning fra kommunale renseanlæg, industrielle udledninger og regnbetingede udledninger*, 2007, 17.

rective. The aim is supposedly to promote coherence between the environment and the agricultural production through technological innovation and modernizing of the agricultural legislation.[64] The strategy is intended part-financed by the Rural Development Program 2010-2013 and new subsidy schemes have been initiated.

Along with the other action plans, the Green Growth Agreement stipulated new reduction targets as well as new measures or instruments. The reduction targets in the Green Growth Agreement were in 2009 set at a 19,000 tonnes reduction in nitrogen leaching, and 210 tonnes reduction in leaching of phosphorus into aquatic environments. These numbers had been assessed as the necessary reduction targets during the process of drafting the River Basin Management Plans.

Owing to the protracted disputes within the government, the Green Growth Agreement was amended in 2010, and 10,000 of the 19,000 tonnes nitrogen reduction target was postponed to be achieved in the forthcoming planning processes. A Nitrogen Committee – an interministerial working group – was established to account for the possibility of implementing the reduction target of the last 10,000 tonnes. The Nitrogen Committee has not yet issued a report.

The previous aquatic action plans established, as their targets, the reduction of nitrogen leaching from the root zone of the plants. The new targets in the Green Growth agreement and the River Basin Management Plans were established in relation to the influx of nitrogen to the aquatic environment.[65] Whereas the target in Aquatic Action Plan III was a 13% reduction in nitrogen leaching from the root zone estimated at approximately 21,000 tonnes of nitrogen, the target in the Green Growth Agreement is a reduction in nitrogen discharge to the aquatic environment from 2010 to 2015, at approximately 19,000 tonnes of nitrogen.

The reduction figures are heavily debated. With the use of the existing models and knowledge of the relationship between nitrogen loading and the condition of the coastal waters, the necessary reduction of nitrogen leaching is estimated by the Nature Agency to be about 31,000 tonnes.[66] However, there is considerable uncertainty

[64] See also in English Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 23.
[65] Miljøstyrelsen, *Danish Nitrate Action Programme 2008-2015*, 5.
[66] Miljøministeriet and Ministeriet for Fødevarer Landdbrug og Fiskeri, *Ålegræsværktøjet i vandplanerne. Arbejdspapir fra Miljøministeriets og Fødevareministeriets arbejdsgruppe om ålegræsværktøjet*, 2011.

regarding these numbers, and they have been reduced in the political process.

The estimate of 31,000 was reduced to 28,000, supposedly in order to account for old data and previously determined, but not yet fully realized measures. Furthermore, a reduction of 30% was agreed by the Green Growth agreement in order to not 'over implement' the provisions of the WFD and adopt unnecessary measures. This has brought the reduction target down to 19,000 tonnes – whereof 9,000 are operationalized with the first cycles of River Basin Management Plans, and 10,000 are postponed to later planning cycles.[67]

The established targets concerning discharged nutrients for the first planning period are:

- A reduction of overall nitrogen emissions from agriculture by approximately 9,000 tonnes (about 16.5%)[68] by 2015 in order to meet the objectives established for the coastal waters.
- Reduction of the overall emissions of phosphorus by up to 190 tonnes (7.1%)[69] in order to meet the objectives for lakes.
- Reduction of pollution from point sources including wastewater treatment plants, storm water overflows, remote dwellings and farms, in order to improve the condition of streams and lakes.

The measures established to meet those targets include:[70]

- Tightening of the nitrogen norms for selected crops
- Ban on cultivation tillage during certain periods.
- Extended use of catch crops (140,000 ha).
- Cultivation-free buffer zones (10 m) along rivers and streams
- Reestablishment of wetlands

In addition to the above targets and measures, the Government has committed to preparing a new plan for managing the reduction of the remaining 10,000 tonnes of nitrogen emissions estimated as necessary for realising the environmental objectives for the coastal waters.

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[67] Naturstyrelsen, *Vandplan 2012 - 2015. Mariager Fjord. Hovedvandopland nr. 1.3*, December 22, 2012, 263.

[68] Based on a total of 55,000 tonnes of nitrogen leaching to the sea annually, cf. Jensen et al., *Vandmiljø og Natur 2010: NOVANA. Tilstand og udvikling - faglig sammenfatning*, 16.

[69] Based on a total of 2,400 tons of phosphorus leaching to the sea, cf. Ibid., 29.

[70] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 330.

The legislation to put these measures into effect is mainly the Act on Fertilizer Use and Plant Cover, Statutory Order on Fertilizer and Plant Cover, Statutory Order on Livestock, Manure and Silage, and Act on Buffer Zones along Streams and Lakes, as described in section 4.3. In addition to this general legislation, a number acts and orders are relevant to the projects concerning reestablishment of wetlands.

There has been a significant delay in the drawing up of River Basin Management Plans in Denmark, in particular due to the political process of setting reduction targets and identifying necessary measures in the Green Growth Agreement. The River Basin Management Plans were adopted in December 2011. Due to a very short (8 days) supplementary consultation period regarding amendments in the plans, the plans have, however, been declared invalid by the Nature and Environment Appeals Board in December 2012.[71] The Ministry of the Environment has initiated a renewed consultation in Spring 2013 and the the River Basin Management Plans will be adopted as soon as possible. However, the plans were also brought to the courts by two different agricultural organizations.[72] The court cases have been dropped as a result of the River Basin Management Plans being declared invalid by the Appeals Board. There are, however, pending court cases regarding some of the measures including the buffer zones.

The EU Commission in June 2010 presented an opening statement to the Danish Government regarding the delays in adopting the River Basin Management Plans and brought the case to the Court of Justice in April 2011. The case was, however, withdrawn after the adoption of the Danish River Basin Management Plans.

### 2.3.4 Marine Strategy Directive

The Marine Strategy Directive is mainly transposed into Danish legislation by the Act on Marine Strategy. The act establishes a framework for a general planning process for the improvement of the environment in the Danish waters – a Marine Strategy.

The instruments to be used or governed by the strategy are not yet determined and/or established. It is expected that the planning or strategy process will identify the needs to complement or modify the vari-

[71] Natur- og Miljøklagenævnet, *Afgørelse i sagerne om vedtagelse af de statslige vandplaner MNK-400-00054*, 2012.

[72] Håkon Djurhus and Landbrug og Fødevarer, *Stævning af 31. maj 2012*, 2012. H. Sønderby Christensen and Landsforeningen for Bæredygtigt Landbrug, "Stævning af Miljøministeriet", 2012.

ous sector laws to the extent necessary for achieving the environmental objectives.[73] Examples of sectoral laws on the environment that are likely to play a role in implementing and realizing the marine strategies include the Act on the Marine Environment, the Act on Environmental Protection, the Act on Nature Protection, and Act on Mineral Resources. Other examples of legislation include the Fisheries Act which, among other things, sets the framework for the activities associated with fishing at sea, and the act on underground resources which among other things regulates oil and gas from the seabed.

The Marine Strategy is given legal effect by § 18 of the Act on Marine Strategy according to which public authorities are bound by the marine strategies when carrying out their responsibilities. Public authorities are obliged to take into account the environmental objectives and the programmes of measures when exercising their powers, as given by the existing legislation. Accordingly, issuing environmental permits is not possible if it would be inconsistent with achieving the environmental objectives.

The Act on Marine Strategy does not in itself give the authorities the power to intervene in on-going lawful activities, nor does it impose an obligation to act on the authorities referred to in the programme of measures. If actions are deemed necessary, it might be established by amendments to the relevant legislation.[74]

The implementation and development of the marine strategies follow the schedule laid down in Article 5(2) of the directive. So far, the initial assessment of the current environmental status and the environmental impact of human activities thereon have been completed.[75] Supposedly, the environmental targets and associated indicators have also been established.[76] A clear description of good environmental status for the Danish waters seems absent in the published material, however.

With reference to Article 1(3) of the Marine Strategy Framework Directive, it is explicitly stated that it is based on an ecosystem approach. This is further described as an approach where the variables,

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[73] Forslag til Lov om havstrategi 2009/1 LSF 107, general comments, section 4.
[74] Forslag til Lov om havstrategi 2009/1 LSF 107, general comments, section 4.
[75] Danish Ministery of the Environments Nature Agency, *Summary of the Initial Assessment*, 2012.Miljøministeriet Naturstyrelsen, *Danmarks Havstrategi Basisanalyse [Høringsudgave]*, 2012.
[76] Danish Ministry of the Environments Nature Agency, *The Danish Marine Strategy Good Environmental Status , Targets and Indicators [Consultation Draft]*, 2012.Miljøministeriet Naturstyrelsen, *Danmarks Havstrategi Miljømålsrapport [Høringsudgave]*, 2012.

for example, the status of a particular species, are not assessed in isolation, but where the marine waters are evaluated from a holistic perspective, taking into account all the components in the ecosystems and their impact including those deriving from human activities.[77] However, the implication of this specific interpretation of the ecosystem approach is not clear.

Establishing the criteria for the descriptors addressing eutrophication follows the Commission Decision (2010/477/EU). Following the decision, the assessment of status and descriptions of targets and objectives are directly related to the assessments of coastal waters established under the Water Framework Directive. Also, with reference to the Commission's decision, the description of eutrophication is that: *human-induced eutrophication and adverse effects thereof such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters is minimized*.[78]

The initial assessments were carried out in June 2012 in accordance with Article 5(2)(a) and 8(1)(a,b) of the Marine Strategy Framework Directive. This assessment recognizes that Danish marine waters are characterized by relatively high nutrient levels, and that achieving good environmental status will require a reduction in the level of nitrogen.[79]

Although the Programme of Measures is not yet prepared, it is probable that it will not contain any measures directed at eutrophication. It is stated in the initial assessment that the necessary reductions in land-based emissions of nitrogen and phosphorous into the sea are expected to occur as the result of the implementation of the River Basin Management Plans, adopted with reference to the Water Framework Directive. This reduction is expected to have a positive effect on both the coastal waters and the open marine waters, and land based nutrient sources are therefore not regarded as interfering with the achievement of good environmental status in open marine waters.[80]

So far, the marine strategy initiatives have been declared unambitious by the three main nongovernmental environmental organizations

[77] Danish Ministery of the Environments Nature Agency, *The Danish Marine Strategy Good Environmental Status , Targets and Indicators [Consultation Draft]*, 5.
[78] The European Commission, *Comission Desicion on criteria and methodological standards on good environmental status of marine waters* (EU, 2010).
[79] Danish Ministry of the Environments Nature Agency, *Summary of the Initial Assessment*.
[80] Ibid.

in Denmark. Greenpeace has delivered a well-qualified criticism of the initial analysis, and the choice of targets and indicators.[81]

## 2.4 Concluding and Summarising Remarks

The implementation of international and EU obligations regarding nutrient pollution in Danish law has been very closely linked to national political agreements of the Aquatic Action Plans and the Green Growth Agreement. The national agreements have had some specific references to international and EU obligations, especially recently with the Green Growth and the River Basin Management Plans as central instruments for fulfilling EU requirements regarding water quality and eutrophication. It may thus be difficult to identify a direct implementation of e.g. the HELCOM and its recommendations or of the Nitrates Directive. The general assumption is, however, that Danish legislation complies with the international and EU obligations regarding nutrient pollution although there may be some minor flaws.

The Danish regulation of nutrients leaching from agricultural sources can generally be characterized as comprehensive, strict and very detailed. The Danish approach to reducing nutrients leaching from agricultural sources has been based on four types of measures:[82]

- Reduction of the permitted use of fertilizer on farmland by introducing binding nitrogen norms and subsequently reducing them or by tightening the requirements for livestock installations and spreading of manure.
- Requirements for improved utilisation of manure, by introducing regulation concerning storage techniques, storage capacity and time restrictions on spreading manure in the winter months.
- Requirements aimed at improved nitrogen uptake in fields in order to reduce nitrogen leaching in periods when there are no crops on the fields. These measures include requirements for catch crops, plant cover during winter and a ban on ploughing and cultivation in certain periods.
- Requirements and projects aimed at changing land use, in order to reduce the impact of the nitrogen surplus from the fields on the surrounding environment. This covers measures for establishing wetlands and buffer zones along streams.

[81] Hanne Lyng Winter, *Greenpeace høringssvar - Den danske havstrategi*, 2012.
[82] See also Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 326.

In addition to these measures, a detailed regulation of manure application through environmental permits for livestock installations exists (see section 4.2).

# 3 Regulation on Sewerage

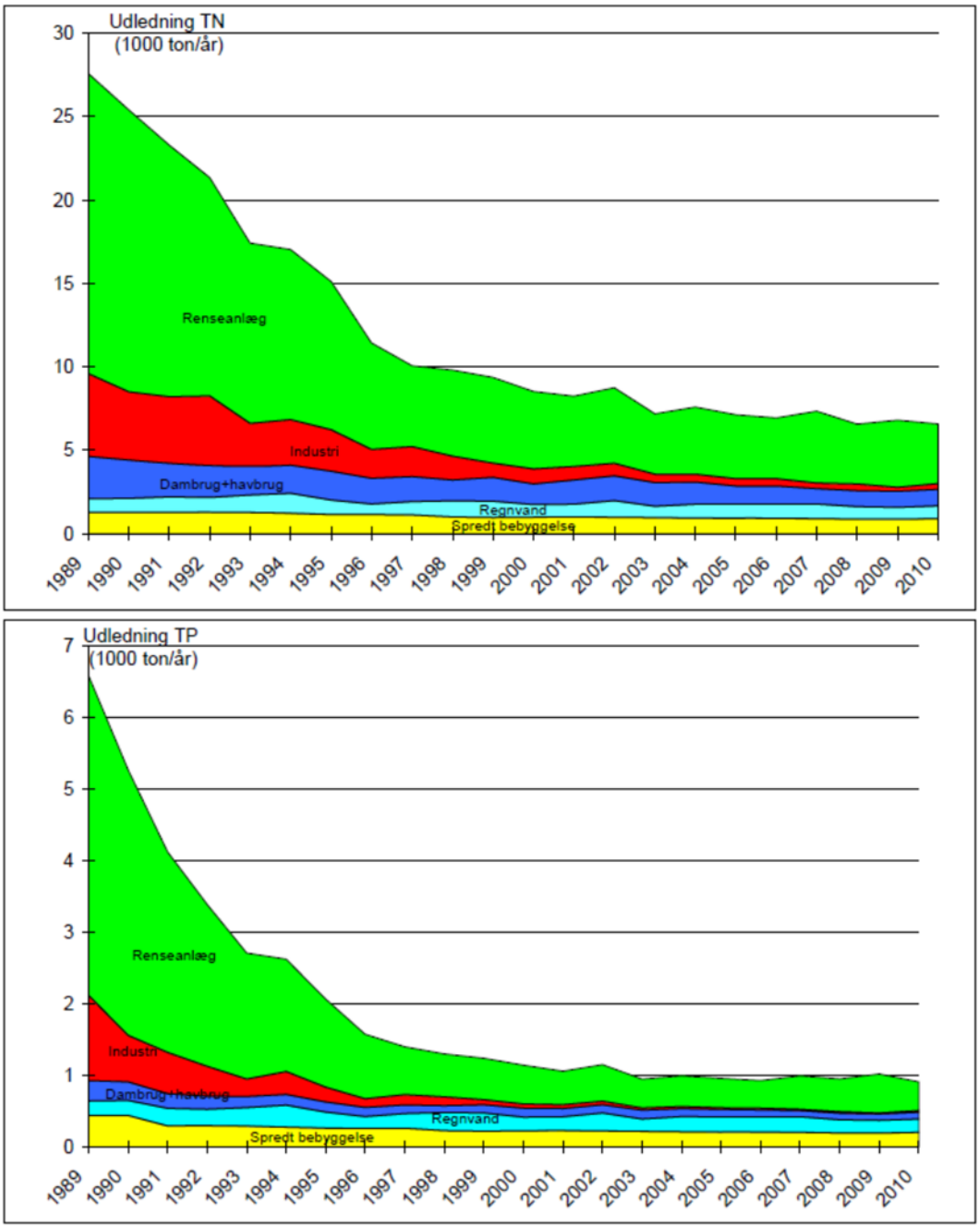
## 3.1 Introduction

The aquatic environment is affected by discharges of wastewater from sewage treatment plants, from industry and from remote dwellings with only minor wastewater treatment.

Typically, wastewater in Denmark is discharged into surface waters (rivers, lakes or sea) or percolated into the ground. Wastewater particularly affects rivers and streams, with its load of oxygen-consuming organic matter, and it affects lakes with its load of phosphorus, but hazardous pollutants and disease-causing bacteria are also problems related to wastewater.[83] However, when it comes do disease-causing bacteria in marine waters, the problem is foremost connected to the bathing waters and not the marine ecosystem as such.[84]

Since the mid-1980s, there has been a significant reduction in the total outlets of nutrients due to wastewater discharges. For nitrogen, the reduction has been about 75%, and for phosphorus about 85%, mainly owing not only to better wastewater treatment in wastewater plants, but also to a significant reduction in the discharges from the industry as shown on the tables below.[85]

[83] Naturstyrelsen, *Vandplan 2012-2015 Østersøen. Hovedvandopland 2.6 Vanddistrikt Sjælland*, 76.
[84] Miljøministeriet Naturstyrelsen, *Danmarks Havstrategi Basisanalyse [Høringsudgave]*.
[85] Naturstyrelsen, *Punktkilder 2010*.




Traditionally, the Danish water supply and sanitation sector has been decentralised in the form of utility companies owned and managed by the municipal councils and small-scale consumer-owned corporations. The water sector underwent a legal reform in 2007 with the purpose of enhancing its efficiency. A core element in the reform was the requirement to organise the supply utilities as companies. There are now just over 1,200 sewage and wastewater companies, of which approxi-

mately 1,000 are owned by municipalities, while the remainders are small-scale, and cooperatively owned.[86]

The 2007 water sector reform involved three main changes to existing legislation. First, it led to an organizational separation of the provision of water services, on the one hand, and, on the other, the exercise of public authority. Water and wastewater utilities may no longer be parts of the municipal administration as such, but must be organized as separate companies. Most water companies are, however, still owned by the municipalities.

Secondly, the legal reform altered the way in which the water service costs are calculated. After 2007, the water companies became responsible for setting the tariffs for their services, while the municipal council's role – ownership notwithstanding – was reduced to that of approving of the tariffs. The municipal council thus secures compliance with the break-even principle.[87]

Thirdly, a state authority, the Water Service Secretariat, was established to carry out a price control system which now serves as an adjunct to the break-even principle. A price cap sets the upper limit for the price on water, while the break-even principle ensures that the price for the services covers the expenses.

The entire sewer system in Denmark is approx. 57,000 km. There is an equal distribution between what is named as separate and combined sewers. Normally wastewater is forwarded through the sewers by gravity but where this is not possible, the sewers use pumping stations. There are approx. 10,000 pumping stations nationwide.[88]

A separate sewer system consists of 2 lines. One line collects sanitary sewage and leads this to treatment plants, where it undergoes treatment before it is discharged. Another line manages the rain- and storm water and leads this directly to the recipient.

The combined sewer is traditionally the most common solution and thus the system that most of city centers in major cities use. This system consists of only one pipe that leads both sanitary wastewater and surface water to the treatment plant. In heavy and extreme rainfalls the capacity of the sewage are exhausted which causes overflow of

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[86] Lasse Baaner, Helle Tegner Anker, and Wieke Huizing Willemijn Edinger, "The Right to Drinking Water and Sanitation in Denmark," in *Implementing the Right to Drinking Water and Sanitation in Europe* (ed. Henri Smets; Académie de l'Eau, 2011), 129–36.

[87] See also Miljøstyrelsen, *Betalingsregler for spildevandsanlæg*, 2001.

[88] Henrik Borg Kristensen et al., *Spildevandsudvalget - Analyse af forskellige modeller til ændring af spildevandsbetalingsreglerne*, 2011, 15.

merged rain and wastewater directly to the recipient. There are approx. 5,100 of those overflows annually.[89]

The Aquatic Action Plan I in 1987 stipulated an environmental objective of reducing wastewater emissions of phosphorus with 80% and nitrogen with 50%. These objectives are considered to have been met and there has been no new reduction objectives regarding phosphorus and nitrogen from sewage treatment plants. Forecasts indicate that Denmark in the future will have more periods of heavy rainfall due to climate changes and rising sea levels.[90] In the context of adaptation to those changes and to the WFD-requirements for the environmental condition of the wasters, the two above sanitation principles come into focus. The main strategy of the wastewater sector is to change the common sewers to separate sewers.[91] This enables that the relatively clean rainwater is discharged directly to the recipient and that the polluted wastewater undergoes a treatment even in heavy rainfall. Hereby overflows of untreated wastewater are minimized. Solutions where rainwater is handled on the properties or used as a recreational element in the city, etc. – often named Local Absorption of Rainwater or LAR – is another option that reduces the pressure on the wastewater treatment plants, and helps achieve the objectives of the Water Framework Directive and the Marine Strategy Directive.[92]

Individual permits for wastewater discharges will be subject to an assessment of the sensitivity of the recipient including the binding environmental objectives laid down in the River Basin Management Plans. This could be seen as reflecting an ecosystem approach. Also local LAR-projects seem to take an ecosystem approach on the local level.[93] However such an approach is not reflected in the regulatory system.

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[89] Naturstyrelsen, *Punktkilder 2010*, 28.
[90] Miljøministeriet Naturstyrelsen, *Danmarks Havstrategi Basisanalyse [Høringsudgave]*.
[91] Kristensen et al., *Spildevandsudvalget - Analyse af forskellige modeller til ændring af spildevandsbetalingsreglerne*, 15.
[92] Naturstyrelsen, *Vandplan 2012-2015 Østersøen. Hovedvandopland 2.6 Vanddistrikt Sjælland*, 80.
[93] Se e.g. www.laridanmark.dk

## 3.2 Sewage Treatment Plants – Agglomerations

The development and infrastructure of Danish wastewater treatment is briefly described in the annual national surveillance report concerning point sources and the aquatic environment.[94]

The report shows that over the past 30 years, there has been a decrease in the number of wastewater treatment plants, and this trend of concentrating the treatment to larger and fewer sites is expected to continue. In 2010, there were 1,030 treatment plants with a capacity greater than 30 person equivalents (PE), of which 222 were private wastewater treatment plants. Despite these numbers, there still remain many small and only a few large wastewater treatment plants. However, the vast majority of wastewater – about 90% – is treated at Denmark's 260 largest wastewater treatment plants. About 80 % of wastewater treatment plants have only a capacity of between 50 and 1000 PE, with the total capacity of only about 25,000 person equivalents which means that they treat less than 1 % of the total volume of wastewater.

In 2010, the total wastewater load for all treatment plants in Denmark amounted to around 7.6 billion person equivalents, while capacity in recent years has remained constant around 12.6 billion PE.

Most of the wastewater is discharged directly into the aquatic environment after treatment, but in 2010 there were still 118 wastewater treatment plants larger than 30 person equivalents where the wastewater is percolated into the ground.

The wastewater treatment plants may be public, or privately owned. The private wastewater treatment plants are primarily small mechanical or biological systems, and the total volume of wastewater treated at these plants constitutes less than 1% of the total amount generated.

The general framework for wastewater regulation includes the Environmental Protection Act, the Act on Wastewater Payment, the Act on Taxes on Wastewater and the Act on the Water Companies.

According to § 32 of the Environmental Protection Act, the municipalities are responsible for drawing up a Wastewater Plan that establishes the structure of the wastewater facilities in the municipality. The content of the plan is further specified in § 5 of the Statutory Order on Wastewater Permits. Thus, the municipal council decides which areas and which properties are to be connected to the common

[94] Naturstyrelsen, *Punktkilder 2010.*

wastewater systems, and where to require individual wastewater solutions. This Wastewater Plan is based on an overarching technical, economic and environmental assessment of what is the most appropriate structure for the municipality.[95]

§ 19 and § 27-28 of The Act on Environmental Protection establishes a general prohibition against discharging wastewater to ground- and surface waters, and a competence for the municipality to issue permits for wastewater discharges. The Wastewater Plan forms the technical basis for the municipalities' permits to connect to the sewerage systems, as well as to discharge and/or percolate wastewater. The environmental basis for such permits is established in the River Basin Managements Plans according to § 3 of the Act on Environmental Objectives.

The Act on Wastewater Payments operates with two types of payments: A connection fee, cf. § 2 and a discharge fee cf. § 2a, according to the actual wastewater discharged. The connection fee is a one-time contribution paid when the property is connected to the wastewater system, while the discharge fee is a continuous contribution paid on the basis of used water. This fee is based on the property's water consumption, as water meters are only established for the use and not for the actual discharge of water from the property.[96]

The payment rules are based on a principle of solidarity. All properties pay the same connection fee and cubic meter charge regardless of the actual connection- and treatment costs to the wastewater company. However, companies with e.g. particularly contaminated wastewater and less contaminated road runoff are subject to special discharge fees, cf. § 2a of the Act on Wastewater Payments.

The sewage tax was introduced in 1993, with the primary goal of providing companies and wastewater treatment plants with an incentive to invest in better technology so that emissions of nitrogen, phosphorus and organic material would be reduced.[97] The sewage tax is, according to § 3 and 8 of the Act on Tax on Wastewater, dependent on the amounts of pollutants in the wastewater. The aim is for the tax on the amounts of emitted pollutants to provide incentives to reduce the levels of pollutants in the wastewater from industrial dischargers and treatment plants, and also to encourage treatment plants to reduce their

[95] See also Lasse Baaner, *Retlige rammer for kommunal vandforvaltning - Planer* (vol. 18; Royal Veterinary and Agricultural University, 2006), 45–57.
[96] Miljøstyrelsen, *Betalingsregler for spildevandsanlæg*.
[97] Erhvervsministeriet *et al*., *Evaluering af grønne afgifter og erhvervene*, 1999, 173.

discharged water volume. Housing in rural areas with individual wastewater treatment is charged at standard rates as per § 8, reflecting the general capacity of the wastewater technology used.[98]

A Wastewater Committee was established in 2010 to analyze possible changes to the payment rules and the possibilities for improving incentives for alternative drainage of rainwater and to ensure a greater degree of consistency between what is paid in wastewater contributions and the costs that water actually causes. The committee's analysis shows that a more expensive genuine payment structure will lead to small businesses and homes in general to experience increases in their costs, while large water-using businesses will experience decrease in their costs for water treatment.[99] Yet no decision or follow-up on the Wastewater Committee report have been taken. Recently though, the amendment of § 1 of the Act on Wastewater Payment has enabled wastewater companies to establish or support projects to reduce run-off to the drainage system.

A report from the Environmental Protection Agency from 1998 showed that a large number of sewerage treatment plants did not comply with their environmental permits.[100] In 1997 this was the case for 20% of the agglomerations. More than half of those did not comply with the permit in 1996 either. Data from more recent surveys have not been found.

The environmental permits for wastewater treatment plants stipulated under § 28 of the Act on Environmental Protection include the conditions of which the plant must comply and the quality standards for the discharged wastewater. The standards are determined on the basis of the Statutory Order on Wastewater Permits, Statutory Order on Environmental Quality Standards for Watercourses, Lakes and Marine Waters and the environmental status of the waters in question. The assessment of whether or not the plant complies with the standards is based on the Danish standard for effluent control.[101] Further, the environmental permits require that the plants account for the use of best available techniques.

A recent amendment to the Statutory Order on Wastewater Permits, cf. § 53a, transposing obligations of the IE Directive, strengthens the

[98] See also Ibid., 172–173.
[99] Kristensen et al., *Spildevandsudvalget - Analyse af forskellige modeller til ændring af spildevandsbetalingsreglerne*.
[100] Miljøstyrelsen, *Punktkilder 1997. Orientering fra Miljøstyrelsen nr. 9*, 1998.
[101] DS 2399. Afløbskontrol, Statistisk beregning af afløbsdata.

obligation to review wastewater permits when new BAT conclusions are published by the EU Commission.

Separate industrial discharges are permitted discharges of treated wastewater directly to surface waters and to the public sewerage system. They typically include wastewater from industrial production, surface run-off, leaches from landfills or contaminated groundwater from remedial pumping of areas with contaminated soil. In every case, discharges directly into water bodies require a permission that establishes the requirement for prior treatment and/or emission limit values. The industrial discharges are regularly supervised by the authorities.[102]

The authorities seem, to some extent, to take a fairly pragmatic view on the permission and enforcement of public wastewater treatment plants. A report from the Environmental Protection Agency from 2007 observes that experiences from the control of discharges from municipal wastewater treatment plants have shown that the more stringent emission standards set, the greater the risk of permits being exceeded. The report further concludes that in order to ensure an appropriate regulatory environment, the emission limit values must be established on a level where it is likely that the requirements will be met at the treatment plants in the long term. If emission standards are set so tough that many well-designed and well-run treatment plants annually exceeds the requirements, it will result in legal uncertainty which should be avoided.[103]

## 3.3 Treatment of Individual Sewage Water Emissions/Private Sewerage

Private households can either be connected to the public sewerage system or have their individual sewage treatment system. The legislation also applies to small-scale common systems which include a few households but those are rare. Generally, urban areas are supplied with common sewerage systems while those systems are rare at remote dwellings in the countryside.[104]

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[102] Naturstyrelsen, *Punktkilder 2010*, 22.

[103] Miljøstyrelsen, *Muligheder for begrænsning af N og P udledning fra kommunale renseanlæg, industrielle udledninger og regnbetingede udledninger*, 19.

[104] Miljøstyrelsen, *Vejledning til bekendtgørelse om spildevandstilladelser m.v. efter miljøbeskyttelseslovens kapitel 3 og 4*, 1999.

Out of the total 2.6 billion of Danish households,[105] around 335,000 remote dwellings and houses in the countryside have individual sewage treatment systems.[106] Over the years, this number has remained relatively constant with only a slight decrease due to a number of properties having been connected to public sewage systems.

The owner of a property is, according to § 28 of the Environmental Protection Act, required to connect to the public sewerage system when a connection is available, and the municipality requests the connection to be made.[107] Unlike many other injunctions, this decision cannot be appealed to any other administrative authority.

§ 30 of the Environmental Protection Act states the basis for the municipality to order improvement and renewal of private wastewater utilities when the treatment is inadequate or environmentally undesirable.

In 1997 a new scheme was introduced for wastewater payment for properties in rural areas – the so-called contractual membership of wastewater supply, cf. § 7a of the Act on Wastewater Payment. The scheme made it compulsory for water companies to offer to take over the wastewater treatment on rural housing when the owner is ordered to improve wastewater treatment. If the water company takes over the wastewater management of the property according to § 7a, the owner only pays costs as if he was connected to the public wastewater system. The reasoning behind the scheme was that the construction and operation of the wastewater solutions in rural areas can be more expensive than being connected to public wastewater services.[108]

The River Basin Management Plans include a zoning of rural areas by three treatment classes with which the wastewater treatment from individual dwellings must comply. The zoning forms the basis for permissions and injunctions, cf. § 28 and 30 of the Act on Environmental Protection. The three classes set the requirements for the capacity of the chosen wastewater treatment system to nitrogen, organic matter and phosphorus, in accordance with the classes 1–3 of HELCOM

[105] Danmarks Statestik, *Nyt fra Danmarks Statestik - Husstande og familier*, 2012.
[106] Naturstyrelsen, *Punktkilder 2010*, 34.
[107] See also Ellen Margrethe Basse, "Miljøbeskyttelsesloven," in *Miljøretten 4: Forurenende Anlæg og Processer*, ed. Ellen Margrethe Basse (København: Jurist- og Økonomforbundets Forlag, 2007), 367.
[108] Kristensen et al., *Spildevandsudvalget - Analyse af forskellige modeller til ændring af spildevandsbetalingsreglerne*, 27.

Recommendation 28E/6 (see section 2.2.3).[109] The requirements of the classes are:

- Treatment reducing organic matter (90%) and phosphorus (90%)
- Treatment reducing organic matter (95%) and nitrogen (90%)
- Treatment reducing organic matter (95%), nitrogen (90%) and phosphorus (90%)

Possible treatment solutions that meet requirements are approved for small wastewater treatment plants cf. Statutory Order on Approval Scheme for small Wastewater Treatment Installations, willow wastewater treatment plant and percolation of wastewater after filtering. Expected to be developed over time are new solutions in this regard.

Generally, the issue for the Environmental Protection Agency and the municipalities is if the wastewater from properties in the countryside is to be treated in a small-scale biological treatment system and thereafter discharged into the aquatic environment (lake, river or stream) or if the wastewater is to be percolated untreated into the ground after a simple settlement of solids.[110] While the first solution is expensive and may to some extent affect the aquatic environment, the second solution is cheap but may threaten the groundwater to be used as drinking water in the future.

The municipality can only order improved treatment of wastewater in rural areas if the property's drainage system and point of discharge is known, and the discharge contributes to the pollution of the aquatic environment where the environmental objectives are not met.[111] There is no assessment of the relative importance of the individual property discharges to the environment.

[109] See also Miljøstyrelsen, *Vejledning for nedsivningsanlæg op til 30 PE*, 2000, 9.
[110] Ibid., 27 ff.
[111] Folketingets Miljø- og Planlægningsudvalg, *Betænkning over Forslag til lov om ændring af lov om miljøbeskyttelse og lov om betalingsregler for spildevandsanlæg m.v. (Spildevandsrensning i det åbne land m.v.)*, 1997. See also Miljøstyrelsen, *Vejledning til bekendtgørelse om spildevandstilladelser m.v. efter miljøbeskyttelseslovens kapitel 3 og 4*.

## 3.4 Ecosystems Approach and Regulation of Sewerage?

Individual permits are generally supposed to comply with the achievement of established water quality standards cf. Statutory Order on Environmental Quality Standards for Watercourses, Lakes and Marine Waters and the environmental objectives established according to the Act on Environmental Objectives. The link between the objectives, quality standards and the wastewater permits is established by the River Basin Management Plans according to the Act on Environmental Objectives. Ideally the River Basin Management Plans establish the need for protection and the measures to attain the necessary improvements of the water bodies. The River Basin Management Plans are then made operational through the adjustment and renewal of the emission limit values in the environmental permissions for industries and wastewater treatment plants.

Compliance with the emission limit values established in the permits is enforced through regular control by the responsible authorities, cf. Act on Environmental Protection §§ 65-67.[112]

The environmental status of the water bodies is monitored through the national Programme for Surveillance of Nature and Water.[113] If the environmental objectives are not achieved, this should lead to adjustment of the measures in the River Basin Management Plants. It is not quite clear whether the Water Framework Directive is regarded as an obligation of result or an obligation of best effort.

While the requirements to adjust permits and renewed permits to the environmental quality standards may reflect an element of adaptiveness in the legal framework, it has not been possible to identify any greater extent of adaptiveness in wastewater management legislation – at least not in the short term. In the longer term, the subsequent tightening of the treatment requirements both when it comes to agglomerations and individual dwellings in the countryside can be seen as adaption to the ecological system.

The regulations do differ according to the sensitivity of areas to which the wastewater is discharged. The zoning in treatment classes according to sensitivity as described above accounts for wastewaters local impact on the aquatic system. Prevention of storm water over-

[112] Se e.g. Naturstyrelsen, *Punktkilder 2010*, 9.
[113] Naturstyrelsen, *Det Nationale Overvågningsprogram for Vand og Natur. NOVANA 2011-2015. Programbeskrivelse del 2.* (Miljøministeriet, 2012).

flows from the sewerage systems, according to their impact on the affected waters, is prioritized in the River Basin Management Plans with reference to the sensitivity of the aquatic environment (see section 2.3.3). The regulation of wastewater treatment plants is to some extent differentiated according to the sensitivity of the affected waters. When issuing the environmental permit for the wastewater treatment plant, the authority must make sure that the discharges do not prevent the water body from complying with the established environmental objective stated in § 3 of the Act on Environmental Objectives.[114]

It is not really possible, from this study, to assess if there are dynamic or flexible ecological standards connected to the ecosystem, but it seems from the study, that there are only sparse direct links between the ecological status of the Baltic Sea ecosystems and the Danish legislation. The requirements for agglomerations and the measures established in the River Basin Management Plans regarding storm water overflows and improved wastewater treatment in rural areas do, however refer back to national political agreements on implementation of the national Aquatic Action Plans, HELCOM, and the Urban Wastewater Directive (see section 2.3.1, 2.3.2 and 2.3.3). In this sense they might be seen in a broader perspective as connected to the environmental status of the Baltic Sea.

The River Basin Management Plans form the basis for the municipal wastewater planning and regulation of discharges to the aquatic environment (see section 2.3.3). Stakeholders and the public have been able to participate in River Basin Management Planning according to the Water Framework Directive and §§ 27-30 of the Act on Environmental Objectives.[115] A comprehensive consultation process has been carried out with more than 4,200 responses from the public and stakeholders. The comments received and some general replies to the comments are accounted for in the plans.[116]

The procedure of adopting a municipal Wastewater Plan includes a public hearing of 8 weeks, cf. Act on Environmental Protection § 32, and Statutory Order on Wastewater Permits § 6, where the different stakeholders have the possibility to comment in environmental and

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[114] Miljøstyrelsen, *Vejledning til bekendtgørelse om spildevandstilladelser m.v. efter miljøbeskyttelseslovens kapitel 3 og 4*.

[115] See European Commission, *Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC)*, 2012, 8.

[116] See e.g. Naturstyrelsen, *Vandplan 2012 - 2015. Mariager Fjord. Hovedvandopland Nr. 1.3* (Miljøministeriet, Naturstyrelsen, 22 December 2012), p. 290 (pp. 260–284).

technical issues.[117] The plan is accompanied by an environmental assessment in accordance with the SEA Directive, cf. § 3 of Act on Environmental Assessment. There is normally no prior public participation as regards wastewater permits and options for appeals are restricted for small-scale facilities. Environmental permits for certain large-scale industrial facilities shall, in accordance with the IE Directive, be subject to public consultation prior to the issuance of the permit.

## 3.5 Concluding and Summarising Remarks

Generally, there is a fairly comprehensive regulation of sewerage from point sources, ranging from sewage plants and industries to individual holdings. The legal framework links the environmental objectives in the River Basin Management Plans to the adoption of wastewater plans as well as to the administration of permits for wastewater discharges. In addition, the River Basin Management Plans identify measures and establish guidelines for wastewater administration and management. This can be seen as a further step in the continued tightening of treatment requirements for initially larger wastewater installations and more recently also smaller wastewater installations.
The emission of nutrients from sewage plants has been significantly reduced in accordance with the reduction targets laid down in the 1987 Aquatic Action Plan I and the Urban Wastewater directive. It is estimated, that further reductions of discharges from sewage plants are not realistic. [118] There is, however, still some progress to be made concerning overflows from the sewerage systems in case of heavy rainfall and concerning the individual treatment of wastewater from dwellings in the countryside.[119]

[117] See also Miljøstyrelsen, *Vejledning til bekendtgørelse om spildevandstilladelser m.v. efter miljøbeskyttelseslovens kapitel 3 og 4*.
[118] Miljøstyrelsen, *Muligheder for begrænsning af N og P udledning fra kommunale renseanlæg, industrielle udledninger og regnbetingede udledninger*.
[119] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 370.

# 4 Regulation on Nutrient Pollution from Agriculture

## 4.1 Introduction

Well over half of Denmark's total area is farmland. Denmark covers 4.3 million hectares, of which 2.6 million hectares were cultivated in 2010. Agricultural land is mainly used for the following crops: rye, wheat, barley and oats that occupy around 1.46 million hectares, while potatoes, sugar beets and corn are also grown over large areas.[120] The Danish agricultural sector provides employment to around 130,000 people, out of which approximately 73,000 are employed in primary agriculture, forestry and horticulture, and 58,000 in the secondary food industry.

In 2011, the agricultural sector's exports were DKK 119 billion, corresponding to 17% of total Danish exports. Of this DKK 119 billion, agricultural products consisting of meat, seeds, grains, skins, plants, and so forth, amounted to DKK 72 billion.[121] Most were exported to EU markets, particularly Germany, England and Sweden, but Japan and China are also large markets for Danish products.

Despite the generally strong position of Danish agriculture, the current economic crisis has led to many farms carrying debt they are barely able to pay, and over the long term, there might be a general mismatch between earnings and debt among the farms.[122] Further restrictions on farming practices are therefore politically controversial.

Environmental and agricultural policies have been closely linked since the early 1980s. Several national strategies and plans directly focusing on the connections between farming and environmental problems have been adopted, and some of them have been related to the implementation of the Nitrates Directive, the Water Framework Directive and the Habitats Directive:

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[120] Fødevareministeriet, http://www.fvm.dk/dansk_landbrug_i_tal.aspx?ID=44927, 2012.
[121] Henning Otte Hansen, *Værdien af den danske eksport af henholdsvis fødevarer og fødevarerelaterede teknologier* (Frederiksberg, 2012).
[122] Jens Hansen and Henrik Zobbe, *Landbrugets gæld* (Frederiksberg, 2012).

- Plan on Nitrates, Phosphates and Organic matter, 1985
- Pesticide Action Plan, 1986
- Aquatic Action Plan I, 1987
- Groundwater Strategy, 1994
- Aquatic Action Plan II, 1998
- Pesticide Action Plan II, 1999
- Ammonia Action Plan, 2001
- Aquatic Action Plan III, 2004
- 'Green Growth', 2009

The new Government of October 2011 announced a National Nature Plan as a part of its projected initiatives.[123] It also announced that it will present a 'Roadmap for full implementation of the EU Water Framework Directive and the Natura 2000 Directives'. As a part of these initiatives, a Committee on Nature and Agriculture was established in March 2012 with the purpose to carry out analyses and propose initiatives to address the structural, economic and environmental problems of Danish agriculture while at the same time improving the state of nature and the environment.[124]

A background report on nitrates from this committee concludes, as had its many predecessors throughout the years,[125] that the main sources of nutrient emissions to Danish lakes, rivers, inlets and most of the coastal areas are found in Denmark. Sea-borne transportation of nutrients from neighboring countries only plays a minor role.[126]

The report also concludes that the reduction of nitrogen in the marine aquatic environment is crucial for restoring aquatic environments to good ecological status. The report furthermore points at the paradox that although nitrogen emissions from agriculture have been halved since the mid-80ies, a corresponding general improvement of water quality remains to be seen. The report thus suggests that existing regu-

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[123] Regeringen, *Et Danmark, der står sammen. Regeringsgrundlag oktober 2011*, 2011, 32–33.

[124] Miljøministeriet Departementet and Ministeriet for Fødevarer Landbrug og Fiskeri Departementet, *Kommissorium for Natur- og landbrugskommissionen*, 2011.

[125] E.g. Jørn Christensen, Peter Bondo; Møhlenberg, Flemming; Lund-Hansen, Lars C.; Borum, Jens; Christiansen, Christian; Larsen, Søren E.; Hansen, Martin E.; Andersen, Jesper; Kirkegård, *Havmiljøet under forandring. Konklutioner og perspektiver fra Havforskningsprogram 90*, 1996. Teknologirådet, *Udledning af næringsstoffer til vandmiljøet. Resumé og redigeret udskrift af høring i Folketinget den 29. oktober 1997*, 1997. Wilhjelmudvalgets arbejdsgruppe vedrørende landbrug, *Natur & Landbrug*, 2001.

[126] Natur og Landbrugskommissionens kvælstofarbejdsgruppe, *Kvælstof*, 2012, 7.

latory instruments should be more differentiated and should target local environmental conditions.[127]

The final report and recommendations from the committee was presented in spring 2013, and may form the basis for new national plans, strategies and initiatives concerning the problem of eutrophication depending upon the political will of the Government.

Regulation of agriculture – and especially livestock installations – has been on the political agenda for decades, and a number of reports on how to design a well-working regulation have been compiled.[128]

The environmental regulation of agriculture can be said to reflect different aspects of an ecosystem approach. The national policies and the general regulation have continually been revised and strengthened with the purpose of improving the aquatic environment. The general regulation is, however, only to a limited extent differentiated on the basis of the sensitivity of individual ecosystems.

When it comes to individual permits for livestock installations there is, in the current regulatory system, a much higher degree of differentiation based on the sensitivity of individual ecosystems, e.g. in relation to Natura 2000 sites as well as protected nature and water bodies with an environmental objective. It is important to note that this regulation, through individual permits, does not only include the installation as such but also the spreading of manure on land thereby regulates a significant part of the agricultural land. The regulation has, however, reached a very high level of complexity and is very resource demanding.[129]

Best environmental practices for agriculture are specified by mandatory rules laid down in binding legislation. There seems to be a bit of confusion in the Environmental Protection Agency on exactly which legislation implements the codes of good agricultural practice arising from the Nitrates Directive. In the report on the Nitrates Directive delivered to the Commission, it is stated that good environmental practices are implemented by Statutory Order on Livestock, Manure and Silage, Act on Fertilizer Use and Plant Cover and Statutory Order on Use of Fertilizer and Plant Cover.[130] However on the homepage of the agency, it is stated that the Statutory Order on Live-

[127] Ibid., 3.
[128] E.g. Husdyrreguleringsudvalget, *Anbefalinger fra Husdyrreguleringsudvalget*, June 2011, p. 16.
[129] Husdyrreguleringsudvalget - Arbejdsgruppen om arealregulering, *Rapport fra Arbejdsgruppen om arealregulering*, 2010, p. 16.
[130] Miljøstyrelsen, *Danish Nitrate Action Programme 2008-2015*, 13.

stock, Manure and Silage and the Act on Charge of Nitrogen Content in Fertilizers implement the Directive.[131] The former seems to be more correct than the latter, but the confusion might reflect the fact that the implementation is divided between the Ministry of the Environment on the one side (livestock, manure etc.) and the Ministry of Food, Agriculture and Fisheries on the other side (fertilizer use, plant cover etc.).

## 4.2 Regulation of Farms

In a Danish context, the existing regulatory system makes it possible to draw a distinction between the regulation regarding agricultural land use in general, in particular related to the use of fertilizers, plant cover etc. which rests with the Ministry of Food, Agriculture and Fisheries, and the regulation regarding livestock installations and manure handling which rests with the Ministry of the Environment. It is also appropriate to make a distinction between the general regulation of fertilizer use (including manure), plant cover etc. in the form of general requirements and the individual regulation of livestock installations, including also manure spreading, through the permit system. [132]

In addition, the Rural Development Programme provides subsidies for agro-environmental measures in accordance with the EU Rural Development Regulation[133] and the Act on Rural Development from 2007. In 2007, the Government aimed to devote 75% of the funding to nature and environmental initiatives,[134] and subsidy schemes are widely used to compensate farmers for some of the supplementary measures according to the Green Growth Agreement and the River Basin Management Plans, e.g. the cultivation free buffer zones.[135]

According to the Act on Fertilizer Use and Plant Cover and the Statutory Order on Livestock, Manure and Silage, the general regula-

[131] www.mst.dk/English/Agriculture/nitrates_directive/implementation_in_Denmark
[132] Anker, 79. See also Helle Tegner Anker, *Miljøretlig regulering på landbrugsområdet* (Jurist og Økonomforbundets Forlag, 1996); Helle Tegner Anker, 'Husdyrbrug og gødningsanvendelse', in *Miljøretten 4: Forurenende anlæg og processer*, ed. by Ellen Margrethe Basse (Jurist og Økonomforbundets Forlag, 2007), pp. 639–714.
[133] (1698/2005EC).
[134] V K Regeringen III, *Mulighedernes samfund. Regeringsgrundlag*, 2007. See also Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*.
[135] Ministeriet for Fødevarer Landbrug og Fiskeri, *Det danske landdistriktsprogram 2007-2013*, 2008.

tion of fertilizer and manure spreading is explained below in section 4.3.

### 4.2.1 Permits for livestock installations

The Act on Environmental Permits for Livestock Installations establishes a comprehensive assessment and permit system, which seeks to regulate livestock installations and the associated spreading of manure in an adequate manner with respect to neighbors, landscape, nature and environment. The Act entered into force on 1 January 2007 replacing former EIA and environmental permit regulation of livestock installations pursuant to the Planning Act and the Environmental Protection Act. It comprises a general reform of the regulation of animal production with the aim of sharing the gains from improved environmental technology between environmental protection and farmers and establishing a single administrative process for issuing of permits.[136] The new act was also passed in response to the continued growth in the size of production units and the need for a more integrated assessment.[137]

The act and associated statutory orders implement provisions from a number of European directives, such as the EIA Directive, the IPPC (now IE) Directive as well as the Birds and Habitats Directives. The act was also aimed at contributing to the fulfillment of the environmental objectives according to the Nitrates Directive and the Water Framework Directive.[138]

The municipality is the licensing and regulatory authority for livestock installations covered by the Act cf. chapter 3, and their decisions may be appealed to the Nature and Environment Appeals Board, cf. § 76. A very high number of permits have been appealed and the Appeals Board has adopted a strict interpretation of the act in particular with regard to the implementation of the Habitats Directive and also to some extent the Water Framework Directive. In Denmark approximately 85 % of the land areas drain to (aquatic) Natura 2000 sites – most of them not meeting the environmental objectives.[139]

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[136] Trine Balskilde Stoltenborg, "Betydningen af habitatdirektivets artikel 6, stk. 3 på husdyrbrugområdet" (Aarhus University, 2012), 215. Regeringen, Dansk Folkeparti, and Det Radikale Venstre, "Politisk aftale om den kommende miljøgodkendelsesordning for husdyrbrug", 2006, 1.

[137] See also Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 22.

[138] Miljøministeren, "Forslag til lov om miljøgodkendelse m.v. af husdyrbrug. L55", 2006.

[139] See Skov- og Naturstyrelsen, 2006: Landbrug og Natura 2000.

The Act on Environmental Livestock Permits sets the framework for issuing the environmental permits. The environmental permits set out the requirements for the livestock installations to reduce the discharge of nitrate and phosphorus to the aquatic environment, and the impact of ammonia on the surrounding environment including neighbors and terrestrial nature areas.[140] Furthermore § 55 specifies the procedures for public involvement, and § 34 entitles the Minister for the Environment to specify the required level of environmental protection when issuing the permits.

The act covers all farms with more than three livestock units. Smaller farms with fewer than 75 livestock units are in most cases subject to a simplified permit process according to § 10, while larger farms are subject to a detailed and comprehensive environmental permit process according to §§ 11-12. The environmental permits are subject to review every 8 years, cf. § 41.

All applications for approval are submitted online,[141] and require detailed specification of the livestock, stables and storage facilities, including choice of technology. Also, the selected crop system and the areas for spreading manure must be specified.

Based on the application, a range of emissions to the air, to surrounding natural areas and to the groundwater are automatically calculated in the application system. The complex calculations of the environmental impact allow the municipality to assess whether the proposed project complies with the environmental protection levels as specified in the Statutory Order on Permits for Livestock Installations with related guidance and BAT standards.

The environmental norms are standardised and termed 'protection levels' in the Statutory Order on Permits for Livestock Installations, cf. § 9. In general it is not possible to require stricter protection of the aquatic environment, than specified by the order. However, the protection of water-dependent Natura 2000 sites has, in particular, led to the establishment of more strict assessment criteria both in a guidance note[142] and in individual permits.[143] The protection levels include a

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[140] See for further introduction Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 352–361.

[141] www.husdyrgodkendelse.dk

[142] Miljøministeriet Miljøstyrelsen, *Vejledning om miljøregulering af husdyrhold,* 2010. *See also* Miljøministeriet Miljøstyrelsen, *Notits: Bilag til notat om Miljøklagenævnets praksis i sager om miljøgodkendelser af husdyrbrug af 6. juli 2009*.

[143] See Helle Tegner Anker, "Miljøklagenævnets praksis efter lov om miljøgodkendelse af husdyrbrug," *Miljøretlige Afgørelser og Domme* (2009): 15.

differentiation of the livestock balance requirements based on the sensitivity of the aquatic environment in the form of three so-called nitrate classes. Similarly, there are differentiated thresholds for ammonia having regard to ammonia sensitive nature areas.

For each application, the municipality must carry out an individual assessment of whether the livestock installation can be permitted, and whether the protection levels are adequate to avoid significant adverse effects on the environment. It is common that conditions regarding crop rotation, catch crops etc. are part of an environmental permit. For the purpose of the individual assessment of compliance with the Habitats Directive, the Environmental Protection Agency has established strict standards in a guidance note[144] which has been confirmed by the Nature and Environment Appeals Board, see further section 4.3.7 below. [145]

Chapter 2 of the Act on Environmental Permits for Livestock Installations and the associated Statutory Order on Permits for Livestock Installations lays down general distance requirements for the localization of farm buildings and storage facilities. Such general requirements may be supplemented with individual assessment and conditions as part of a permit process. The individual assessment regarding localization of farm buildings will, in particular, be based upon the "protection levels" stipulated in the statutory order in particular as regards odour and ammonia sensitive nature areas stipulated in the Statutory Order.

## 4.3 Substantive Rules of Nutrient Pollution from Agriculture

### 4.3.1 General overview

The regulation of the agricultural use of fertilizers as well as run-off and percolate outlets into the aquatic environment is, as mentioned above, based on a general regulation of all farming activities, and individual permits for livestock installations and the associated use of

[144] Miljøministeriet Miljøstyrelsen Miljøministeriet Miljøstyrelsen, *Vejledning om miljøregulering af husdyrhold,* 2010.
[145] See Anker, "Miljøklagenævnets praksis efter lov om miljøgodkendelse af husdyrbrug."

manure, see above 4.2 regarding the individual permits. The individual permits for livestock and use of manure supplement the general regulation through additional requirements regarding manure spreading and cultivation practices, e.g. for land that drains to nutrient sensitive Natura 2000 sites. The extent to which the regulation is dependent upon or linked to water quality objectives and standards varies from one piece of regulation to another. While the individual permits are generally closely linked to water quality objectives and standards, the general regulation of fertilizer use is only indirectly linked to water quality objectives and standards at a more overall level. However, some of the general measures included in the River Basin Management Plan, e.g. additional catch crops, will be more directly linked to the sensitivity and environmental objectives of water bodies.

The general regulations, with a focus on reducing nutrient losses to the aquatic environment, include, in particular:

- Establishment of general nitrogen norms for various crops
- Establishment of general nitrogen equivalents for livestock and manure
- Efficiency rates for the use of nitrogen in manure
- Requirements of fertilizer accounting at farm level with reference to the nitrogen norms and nitrogen equivalents
- Prohibition of tillage and ploughing during certain periods during the year and in buffer zones along watercourses and lakes
- Requirements of catch crops
- Regulation of storage, handling and application of manure

This general regulation of agricultural practices is supplemented by legislation providing for water management projects, e.g. wetland restoration, on different scale ranging from small projects on farm level to larger projects that include larger areas of the flood plain of rivers and streams. As a result of the River Basin Management Planning process (see section 2.3.3 and 5.2), 130 projects downstream on rivers, a total of approximately 8,000 hectares; have been identified as potentially restored wetlands. The aim is reducing the nitrogen load to inland waters and estuaries by a total of 1,130 tonnes of nitrogen per year. The smaller wetland projects are funded by the government and

administered by the municipalities,[146] while the larger projects are funded by the government and administered by the Nature Agency.[147]

### 4.3.2 Fertilizer accounting and nitrogen quotas

A regulatory system of fertilizer accounts has evolved through the Act on Fertilizer Use and Plant Cover.[148] It is mandatory to prepare and submit an annual fertilizer account for the total fertilizer consumption on the farm, which shall not be higher than the nitrogen quota as established by the chosen crops and the corresponding nitrogen norm. The fertilizer account also documents whether the livestock balance requirement for applying manure equivalent to a maximum of 140 kg N/ha, 170 kg N/ha or 230 kg N/ha is observed. As the fertilizer accounts are reported online,[149] it is, for the purpose of supervision and control, possible to determine at farm level whether a farmer has complied with the provisions on nitrogen use and the calculated nitrogen quota for the farm.

The calculated nitrogen quota for the farm is the central regulatory instrument for reducing nitrogen leaching into the aquatic environment. This quota is based on three main regulatory features 1) the nitrogen equivalents in the produced (or bought) manure 2) the nitrogen norms for the chosen crops and 3) the annual nitrogen forecast as laid down in Statutory Orders.

### 4.3.3 Nitrogen norms, nitrogen equivalents and the nitrogen forecast[150]

Both nitrogen norms for various crops and nitrogen equivalents for manure from various livestock types are established by the Nitrogen Norm Committee. Each spring the committee recommends the economically optimal nitrogen standards for the various crops and stand-

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[146] See KL and Miljøministeriet, "Aftale om styringsmodeller for udmøntningen af vådområde- og ådalsindsatsen og om den øvrige indsats på vand- og naturområdet."

[147] Naturstyrelsen, "Statslige vådområdeprojekter," *2012*, n.d., n.p. [cited 24 April 2013]. Online: http://www.naturstyrelsen.dk/Naturbeskyttelse/Naturprojekter/Projekttyper/Vandprojekter/statslige_vaadomraadeindsats/Vaedomraedeprojekter/.

[148] See also Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 22.

[149] www.landbrugsindberetning.dk

[150] See also in English: Latvian Rural Advisory and Training Centre et al., *Agri-environmental measures in the Baltic Sea Region Agri-environmental measures in the Baltic Sea Region Advisory services , legislation & best practices*, 2011, 59.

ard figures for nitrogen content in manure, followed by the annual nitrogen forecast.

The nitrogen norms and equivalents are determined and legally established by a statutory order by the National Agro Business Agency on the basis of the recommendations by the Nitrogen Committee in the manner that the committee determines the economically optimal fertilization, and these figures are subject to a standard reduction ratio (pt. 14 %) by the agency, pursuant to the established political agreements.

The nitrogen norms establish the permissible amounts of nitrogen allocated for the various crops. The economically optimal fertilization, as determined by the Nitrogen Committee, is calculated on the basis of price relationships between crop yield, crop prices and nitrogen prices, and experimental surveys, providing a link between yield and nitrogen input. The Nitrogen Norm Committee may, in these calculations, make a differentiation between soil types, regions or other relevant divisions.

When the National Agro Business Agency decides on the nitrogen norms for various crops, the figures recommended by the Nitrogen Committee are adjusted with reference to a calculated, politically-determined national quota, present land use and crop surveys, and the Annual Nitrogen Forecast. [151] The nitrogen forecast is a central adaptive feature of the norm system and of great significance. The nitrogen forecast determines how much nitrogen is available for the crops at the start of the growing season. If it has rained much during winter, nitrogen has leached into the aquatic environment and only little remains available to plants. This would make the nitrogen forecast positive allowing a greater use of fertilizer than normal, in order to satisfy crop needs. In the opposite scenario of a very dry winter, the forecast will be negative as there is more available nitrogen in the soil, and hence the nitrogen norms are generally reduced.

The forecast is established by analyzing the content of nitrate nitrogen and ammonium nitrogen in soil samples based on a nitrate study grid. The studies are carried out by Aarhus University, and consist of a network of fixed, adjacent points where current agricultural practices are monitored.

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[151] See e.g. Ruth Grant, Finn Vinther, and Hanne Damgaard Poulsen, *Strategisk Miljøvurdering Status for udviklingen i landbruget siden 2005 – herunder status for VMPIII 2008 og 2009*, 2011, 6; Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 345.

The nitrogen forecast in total for the country varied between +14.000 tonnes of nitrogen in both 1994 and 1995, and −30,000 tonnes of nitrogen in 1996. The average for the period of 1990-2007 was −2,700 tonnes of nitrogen.

The nitrogen forecast is established as legally binding by the National Agro Business Agency in the Statutory Order of Nitrogen Forecast. The order determines the corrections that the farms in each municipality must make to their fertilizer accounts.

The nitrogen equivalents in manure are established by the Statutory Order on Livestock, Manure and Silage. This contains detailed rules for the farmers to calculate the total content of nitrogen in the manure from their livestock. The main element is the annually updated nitrogen equivalent for manure. These are like the norms for crops established by the National Agro Business Agency, upon recommendation from the Nitrogen Committee.

The nitrogen equivalents for the content of nitrogen in manure are based on research, surveys and statistics from several institutions. New knowledge is gathered and the equivalents are updated annually.[152]

While the nitrogen forecast and the nitrogen equivalents for livestock are in principle scientifically determined, the nitrogen norms for various crops are subject to a politically determined reduction rates named the standard reduction ratio first introduced by the Aquatic Action Plan II in 1998 (see section 2.3.2).

As explained above, the nitrogen norms are determined and legally established by the National Agro Business Agency, following the recommendations made by the Nitrogen Committee. The committee determines the economically optimal fertilization, figures which are subject to a reduction ratio by the agency, pursuant to the established political agreements on the national use and leaching of nitrogen. Other factors are also taken into account – for example crop shifts and changes in the sizes of the cultivated areas – but basically the standard reduction ratio are aiming at making the overall national use of fertilizer comply with the political agreements on nitrogen reduction. There are some delays in the process, the adjustment due to changes in area use on national level is recorded in the monitoring system and thus is delayed with two years.[153]

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[152] See e.g. Ibid., 349.

[153] See also Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 22.

In 2012, the standard reduction ratio was calculated by National Agro Business Agency at 14.96 %, and in 2013, at 13.84 %.

The maximum use of phosphorus on the individual farm is not controlled by a complex system like the regulatory system established for the control of nitrogen. The use of phosphorus seems only to be controlled by the amount of maximum livestock units per hectare, and requirements of a certain phosphorus balance in the individual permit system for livestock installations depending upon the sensitivity of the area.[154] It has, however, been argued that the regulation is insufficient to reduce the significant surplus of phosphorus in Denmark.[155]

### 4.3.4 Prohibition of tillage and ploughing in certain periods of the year and in buffer zones along watercourses and lakes

Postponing or delaying soil tillage to the spring will reduce nitrogen leaching from the fields during winter. The presence of weeds or other plant cover helps to reduce the runoff and the percolation by absorbing or holding on to the nitrogen. Pursuant to § 34 of the Statutory Order on Fertilizer and Plant Cover, it is prohibited to till prior to the first of November for spring-sown crops in clay and humus soils, and the first of February in sandy soil.

The conversion of grassland releases large amounts of nitrogen. By postponing the time for conversion of grassland from the autumn to the spring, nitrogen leaching is reduced. Therefore, § 35 of the Statutory Order on Fertilizer and Plant Cover also includes rules prohibiting the conversion of grassland between 1 June and 1 February.

Buffer zones have been promoted as a cost-effective environmental measure, in order to provide the necessary measures to meet the environmental objectives of the Water Framework Directive. § 1 of the Act on Buffer Zones along Streams and Lakes of 2011, therefore, introduced a requirement for establishing 10 metre buffer zones along all watercourses and lakes (above 100 m2) on agricultural land in order to reduce the emission of nitrogen, phosphorus and pesticides into the aquatic environment. In the buffer zones, not only all cultivation, but also the use of fertilizers and pesticides is prohibited.

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[154] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 343.

[155] Latvian Rural Advisory and Training Centre et al., *Agri-environmental measures in the Baltic Sea Region Agri-environmental measures in the Baltic Sea Region Advisory services , legislation & best practices*, 59.

The effect of approximately 50,000 hectares of buffer zones was estimated to reduce nitrogen leaching into the aquatic environment by approximately 2,550 tonnes, and reduce phosphorus leaching by up to 160 tonnes per year.[156] However, researchers at Aarhus University have questioned this effect of the buffer zones.[157]

The buffer zones have given rise to intense public debate. The debate has focused on whether buffer zones amount to expropriation despite the fact that landowners are being economically compensated, on compensation levels as well as on the contested effect of the buffer zones and the rules regarding public access in zones. The Agricultural Association has brought a lawsuit against the Ministry of Food, Agriculture and Fisheries.[158]

### 4.3.5 Catch crops

Catch crops as well as winter green cover have an effect on the reduction of nitrogen leaching into the aquatic environment. Therefore, the farmers also have to meet requirements in the Act on Fertilizer Use and Plant Cover concerning catch crops. The Aquatic Action Plan III determined that the catch crop requirements should be set to 10 and 14 %, respectively, depending on whether the farmer has more or fewer than 0.8 livestock units per hectare, and therefore has used more or less manure on the fields. This requirement affected approximately 240,000 hectares of farmland.[159]

By the political agreement, Green Growth, it was decided to implement a further 140,000 hectares of catch crops, in addition to the 240,000 acres that have already been established. The 140,000 hectares of additional crops shall be determined in the 23 river basins in Denmark where there is sufficient knowledge to establish adequate correlations between the nitrogen load on the fields and the environmental condition of the coastal areas. The development from general requirements applied likewise on the whole territory to requirements concerning specific river basins which reflects to some extent a progress in direction of an ecosystem approach. The River Basin Management Plans identify the catch crop areas, and establish a percentage

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[156] Regeringen, *Grøn Vækst* (Økonomi- og Erhvervsministeriet, 2009), 8,14.
[157] Brian Kronvang, "Miljøeffekten af randzoner," in *Plantekongres 2013*, 2013, 310–13.
[158] Djurhus and Landbrug og Fødevarer, *Stævning af 31. maj 2012*.
[159] Regeringen, Dansk Folkeparti, and Kristendemokraterne, *Aftale om Vandmiljøplan III 2005-2015*, 2.

requirement to be used by the individual farmers. The development of a 'calculator' that enables the farmer to calculate individual crop requirements is also envisaged.[160] Implementation of the additional 140.000 ha of catch crops is now postponed due to the Nature and Environment Appeals Board declaring the River Basin Management Plans invalid (see section 5.2).

### 4.3.6 Regulation of storage, handling and application of manure[161]

The Statutory Order on Livestock, Manure and Silage includes requirements on storage and application of manure. The Statutory Order was amended in June 2012 including also some provisions on the spreading of other fertilizers than manure in accordance with the Nitrates Directive.

According to § 28 of Statutory Order on Livestock, Manure and Silage, it is not allowed to wide-spread slurry on the fields. The application must be done by dragged hoses or, if the field is bare soil or grassland, ploughed directly into the ground. It is furthermore not allowed to cause nuisance to surrounding neighbors.

Basically, it is prohibited to spread manure from harvest until 1 February, cf. Statutory Order on Livestock Manure and Silage § 29. However there are some exemptions depending on the type of manure – solid, liquid etc., the application area and subsequent crop choice. A general prohibition including other types of fertilizers applies from 15 November until 1 February. It is also prohibited to spread manure and other fertilizers, where there is a danger that it will flow into the aquatic environment, e.g. if the area is sloped towards rivers and lakes.

Recently a new Statutory Order on Control of Storage Facilities for Slurry increases the frequency of inspection of facilities from every 10 to every 5 years for slurry tanks located within 100 meters from streams and lakes over 100 m². At the same time it became mandatory for the developer to follow a build sheet for slurry tanks. The new order implements political agreements on increased manure storage security.

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[160] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 335.

[161] See also for a short introduction in English: Latvian Rural Advisory and Training Centre et al., *Agri-environmental measures in the Baltic Sea Region Agri-environmental measures in the Baltic Sea Region Advisory services , legislation & best practices*, 58.

### 4.3.7 Nitrogen requirements in environmental permits for livestock farms

As mentioned above, when issuing environmental permits for livestock farms, the municipalities must ensure that the emissions do not exceed the 'protection level' established by the Statutory Order on permits for livestock installations, see above 4.2.

The nutrient related protection levels are established with a main focus on protecting 'wet' Natura 2000 sites sensitive to nitrate pollution.

The statutory order operates by limiting and differentiating the amount of manure that may be spread per hectare, compared to the general rules in the Statutory Order on Livestock, Manure and Silage. If the area is not sensitive, there are normally no requirements beyond the general requirements.

The tightening of the use of manure is dependent on the soil and catchment area, and maps with Nitrate Classes have been drawn up and incorporated in the online application system.

The Statutory Order on Permits for Livestock Installations prescribes an assessment of the farm emission of nitrate to surface waters, and the Nitrate Classes form the basis for an individual assessment of livestock installations that drain to sensitive Natura 2000 areas and for the setting of further restrictions in the environmental permit. The assessment is carried out by the municipalities as part of the permit procedure according to guidelines from the Environmental Protection Agency.[162]

The Nitrate Classes are based on data from the national monitoring programmes, mapping nitrogen transport from the catchment areas to the individual coastal water bodies and Natura 2000 sites. This mapping is based on the annual flow weighted concentrations and a water flow corrected for climatic variations, taking into account the nitrogen reduction ability of the soil. Further; the Natura 2000-sites are assessed as either very nitrogen sensitive or just sensitive. Their corresponding catchment areas are hereafter subject to some general restrictions on the number of allowed livestock units per hectare in the environmental permit.[163] So, if the soil is poor at reducing the content

[162] See for a thorough analysis Stoltenborg, "Betydningen af habitatdirektivets artikel 6, stk. 3 på husdyrbrugområdet."

[163] Se also a brief explanation at the Environmental Protection Agency's English homepage: http://www.mst.dk/English/Agriculture/environmental_approvals_for_livestock_holdings/map_for_nitrate_classes/

of nitrates when leaving the root zone and before entering the groundwater and draining to sensitive Natura 2000 surface waters, the amount of manure allowed to be used may be reduced by up to 50 % of the general maximum.[164]

The Environmental Protection Agency has, in addition to the protection levels, issued guidance setting what can be even stricter requirements depending upon the sensitivity, taking in account the cumulative effects or trends of livestock installations in the catchment area. According to the guidance, the livestock pressure in the area must not be increasing and the total nitrogen load from the farm must not exceed 5 % of the total load to the water area – or 1 % in case of very sensitive areas.[165]

The strict requirements for application of manure can be met by alternative measures with the same effect on nitrogen leaching. The use of catch crops may be one option, and the use of other crop rotations may be another. In practice, these other measures are widely used by the farms in order to be able to continue to spread the maximum amount of manure over their land.[166]

### 4.3.8 Compliance and enforcement

In general, compliance with the agricultural regulations is considered to be good.[167] In 2007, the official control demonstrated, for example, that only 8% of the reported catch crop areas did not fulfil the necessary coverage of 40%, which implies a relatively high degree of compliance regarding this measure,[168] though, recently there have been cases in which farmers and companies have imported pesticides and fertilizer from Germany. This fertilizer is not registered with either a Danish supplier or buyer and is not included in the farms' fertilizer accounts, making it possible for farms to exceed their current nitrogen quotas. This has resulted in the prosecution of a number of farmers for over-fertilisation. In August 2012, 236 such cases were handled.[169]

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[164] Statutory Order on Permits for Livestock Installations, annex 1, section 1D.
[165] The guidance is only accessible online on: www.mst.dk/husdyrvejledning.
[166] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 355.
[167] See e.g. NaturErhvervstyrelsen, *Pressemeddelelse: Landmænd begår færre alvorlige fejl*, 2012.
[168] Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 22.
[169] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 451.

The municipalities carry out a regular farm-level control of compliance with the Act on Environmental Protection and Act on Permits for Livestock Installations and permits issued according to this legislation. In addition to the environmental legislation, municipalities are also responsible for the control and supervision of a part of the legislation protecting nature – e.g. the Nature Protection Act. An agreement between the Ministry of Environment and the municipal organization Local Government, Denmark, KL has established minimum frequencies for the control and supervisions of farms.[170] According to the agreement, the municipality must carry out control of all farms with more than 75 livestock units over a 3 year period and farms with 3-75 livestock units over a 4-year period. According to the municipalities' supervisory report, there are approx. 28,100 farms which are covered by the agreement and annually the municipality carries out around 7,800 inspections.[171] The municipalities must annually report data on these inspections to the Environmental Protection Agency, and all the data can be found at www.tilsynsdatabasen.dk.

The cross compliance rules according to the EU CAP reform of 2005 seem to have a significant impact on the farmer's compliance with environmental legislation. The cross compliance rules imply that the farmer have to meet the stipulated requirements concerning nature protection, environmental requirements and animal welfare in order to receive his full agricultural subsidies. If one or more of the requirements are not met, the farmer will be subject to deductions from his subsidies with a percentage consistent with the size of the offence.[172] Approximately 50,000 farmers receive EU-subsidies, whereof 3 % is reported not to comply with the rules. In 2011 the total repayment requirements under cross compliance rules amounted to 17.6 million or approx. 0.25 %.[173]

[170] See Anker, "Miljøregulering af landbrugets husdyrproduktion og tilhørende arealanvendelse."
[171] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 445.
[172] See Ministeriet for Fødevarer Landbrug og Fiskeri, *Vejledning om krydsoverensstemmelse 2012*, 2012.
[173] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 280.

## 4.4 Ecosystems Approach and Regulation of Agriculture

Environmental objectives and ecological standards generally underpin the environmental regulation of agriculture. The reduction targets and measures imposed are the result of a recognised need to address nutrient pollution of the aquatic environment. The reduction targets and measures have continuously been adapted through the various national agreements and action plans to meet the environmental objectives. However, it appears that the actual environmental improvements or effects remain to be seen. This is partly due to a significant time-lag in particular as regards coastal and marine waters.[174] Another explanation can be the complexity of regulating nutrients – in particular if economically viable farming practices are supposed to continue. As a consequence, an even more targeted and differentiated approach is being considered, e.g. by the Livestock Regulation Committee as well as the Nature and Agriculture Committee.

Looking at the Danish regulatory system for nutrients, it is important to distinguish between the general regulation – mainly laid down in the Act on Fertilizer Use and Plant Cover – and the individual regulation primarily through environmental permits of livestock installations and the associated manure spreading. While the general regulation of e.g. fertilizer use is only to a limited extent differentiated according to the sensitivity of water bodies and ecosystems, the individual regulation through permits allow for an individual assessment of the cultivation practices and manure application at farm-level in view of e.g. water quality objectives and standards for individual water bodies. In addition to these two main types of regulations, a considerable effort to identify and restore wetlands is also an important part of regulation on nutrients as well as the recent 10 m cultivation free buffer zones (see section 4.3.4). While the designation of potential wetlands for restoration is more targeted as a measure to meet environmental objectives and standards of individual water bodies, the 10 m cultivation free buffer zones are general and only linked to the overall environmental objectives. From an ecosystem point of view, it might make more sense to establish more targeted cultivation free zones depending upon the actual environmental conditions in the area.

[174] Miljøministeriet and Ministeriet for Fødevarer Landdbrug og Fiskeri, *Ålegræsværktøjet i vandplanerne. Arbejdspapir fra Miljøministeriets og Fødevareministeriets arbejdsgruppe om ålegræsværktøjet*, 11.

The general regulation of agricultural nutrients is based on nitrogen standards for various crops and established standard contents of nutrients in manure from different farm and storage systems. There is a continuous development in the use of different crops among farmers, including increased use of catch crops, development in yield potential and nutrient composition of manure, as a result of changes in feeding, housing and so on. Knowledge about these matters is generated by the universities,[175] and used as a resource for the work of the Nitrogen Committee.

The Statutory order on fertilization and plant cover contains rules on how much fertilizer can be assigned for each crop. This figure is calculated once a year – to some extent reflecting an adaptive ecosystem approach at national level. It may, however, be noted that the nitrogen norms are not set (and differentiated) on the basis of the environmental sensitivity of the specific ecosystems (see section 4.3.3).

The individual regulation – which is to a high extent standardized – in the environmental permit system can be said to reflect an ecosystem approach in the sense that the norms are differentiated depending upon the sensitivity of the ecosystems, e.g. as reflected in the so-called nitrate classes and in the additional criteria established in the guidance, see section 4.3.7.

Stakeholder involvement is a well-known phenomenon in Danish environmental regulation. This is partly reflected in the process of adopting of nitrogen standards. As regards the environmental permits, there is some degree of public participation for larger livestock installations and for other installations that significantly may affect the environment, cf. § 55 of the Act on Permits for Livestock Installations. It must, however, be noted that such cases are generally characterized by an extremely high level of complexity. Environmental organizations have been very active in launching administrative appeals and have also been successful in the majority of cases, e.g. by stressing the need to meet ecological objectives and in particular the requirements of the Habitats Directive.

[175] Århus Universitet and Fødevareministeriet, *Bilag 1 b til aftale mellem Aarhus Universitet og Fødevareministeriet om udførelse af forskningsbaseret myndighedsbetjening m.v. på AU/DCA 2012-2015*, 2012, 5.

## 4.5 Concluding and Summarising Remarks

The Danish regulation of nutrient pollution from farming has been subject to continuous political attention and initiatives since the mid-80ies. The strong national policy focus means that international obligations such as the HELCOM and the Baltic Sea Action Plan have not been afforded specific attention assuming that the Danish regulation would be sufficiently strict to meet such obligations.

The long history of regulating agricultural nutrients has resulted in a very comprehensive and detailed regulation both in the form of a detailed general regulation of the use of fertilizers etc. and in the form of an individual permit system for livestock installations including the associated spreading of manure. The individual permit system does not only apply to large farms, but also to smaller farms.

The general regulation of fertilizer use includes a fairly adaptive system for establishment of nitrogen norms and quotas as part of the fertilizer account system. However, the general regulation is not differentiated according to the sensitivity of specific areas. The individual permit system includes a detailed regulation of manure spreading and cultivation practices at farm level. This includes a comprehensive assessment of the environmental effects upon sensitive areas based on the so-called protection levels. The result is a fairly strict regulation of livestock installations and the spreading of manure that is highly dependent upon the ecological status of the surrounding environment and the environmental objectives.

The regulation of farming activities has resulted in a significant reduction of nitrogen pollution by 48 % compared to the mid-80ies. However, the environmental effects remain to be seen in particular in coastal and marine waters. Accordingly, calls have been made to introduce a new and even more differentiated regulation of agricultural nutrient pollution.

# 5 Water Quality – Planning and Management

## 5.1 Introduction

Denmark has four river basin districts that are subdivided into 23 river basins. For each river basin a River Basin Management Plan has be made with the purpose of fulfilling the Provisions of the Water Framework Directive. There are no overall River Basin Management Plans for each of the four River Basin Districts identified in the Act on Environmental Objectives. The act does not refer to the subdivision of the four river basin districts into 23 sub-basins which has been determined at administrative level when drawing up the River Basin Management Plans. All river basins drain to the North Sea and the Baltic Sea. The status of the water bodies is generally insufficient to meet the requirements of the Water Framework Directive.

The central national strategies consist of the various Aquatic Action Plans and the current Green Growth Agreement on the measures to be used in the River Basin Management Planning to limit pollution from agriculture (see section 2.3.1 and 2.3.3). As mentioned, the Green Growth Agreement was specifically designed to identify and obtain political agreement upon the measures necessary to meet the WFD objectives as regards agricultural nutrient pollution, e.g. additional catch crops, cultivation free buffer zones etc. This closely mirrored the approach adopted in the previous aquatic action plans which have resulted in the nitrogen load from agriculture being halved since the mid 80ies.

The planning provisions for Natura 2000-sites and river basin districts are jointly implemented through the Act on Environmental Objectives, with the aim of enabling a synergetic effect between the development of Natura 2000 Plans and River Basin Management Plans. However, owing to the legacy of the aquatic action plans, in relation to agriculture, the elaboration of the River Basin Management Plans appears to be receiving relatively greater attention than the Natura

2000 plans.[176] Furthermore, it is quite unclear if and how there has in fact been any co-ordination between River Basin Management Plans and Natura 2000 Plans. There are no legislative requirements or stipulated procedures to ensure a proper co-ordination apart from the fact that both types of plans are prepared by the Nature Agency.

On a national scale, and within the time span of decades, the national agreements do reflect a more overall ecosystem approach to the management of coastal waters and the Baltic Sea (see section 4.4). The national agreements do respond to the development in the environment, the new knowledge about the environmental problems and surveys made by the authorities and research institutes. Despite continuous adjustment of reduction targets and measures, the aquatic actions plans have, however, primarily been based upon general measures that have not been linked to or differentiated according to the sensitivity of specific areas or ecosystems.

## 5.2 The Water Management System

The Danish River Basin Management Plans and Programmes of Measures according to the Water Framework Directive have been drafted by the Nature Agency under the Ministry of the Environment, and enacted by the Minister for the Environment, cf. § 28 of Act on Environmental Objectives. The Ministry of the Environment is the water district authority according to the Water Framework Directive, cf. § 2, and the Danish Nature Agency under the Ministry of the Environment is responsible for the task of developing the River Basin Management Plans. This implies that the Minister has the overall responsibility for ensuring that the River Basin Management Plans are established, and that the environmental objectives of the water bodies are met.

The River Basin Management Plans are designed with a legally binding section and an explanatory section in accordance with the tradition of Danish spatial planning.[177] The legally binding section includes the environmental objectives for the individual bodies of water, the Programme of Measures, and a set of Administrative Guidelines that are seen as instructions directed at the administrative author-

[176] See also Larsen and Vinter, *Implementability of agro-environmental targets in Denmark*, 27.
[177] See also By- og Landskabsstyrelsen, "Hvordan læses en vandplan?", 2010.

ities.[178] The Administrative Guidelines shall be taken into account in accordance with § 3 of the Act on Environmental Objectives when issuing new environmental permits and environmental approvals. As an example a guideline in the River Basin Management Plans requires that permits for livestock installations (se section 4.2) do not compromise the environmental objectives for the water bodies established in the River Basin Management Plan when it comes to percolate, drainage and run-off of nitrogen and phosphorous.[179] This implies – according to the guidelines - that permits allowing increased influx to the aquatic environment, as a rule can only be granted if it is established that the permit does not lead to a deterioration of water body, and permits allowing increased exposure to the aquatic environment where objectives are not met as a rule can only be granted if it is shown that the environmental objective regardless of the license can be achieved by other means. The legal implications of these guidelines have, however, been questioned by the Environmental Protection Agency.[180]

According to chapter 11 of the Act on Environmental Objectives, municipalities shall develop Municipal Water Action Plans for how the Programmes of Measures included in the River Basin Management Pans shall be implemented locally. A Municipal Water Action Plan shall describe the local initiatives necessary to implement the Programmes of Measures.[181] The Municipal Water Action Plans will rely on the regulatory measures available in the legislation, e.g. the powers to adjust wastewater plans, administer permits, order a clean-up or initiate wetland restoration. Most of the measures have, however, been laid down in the River Basin Management Plans and the task for the municipalities is primarily to specify those measures and indicate local priorities.

Consultations on the draft River Basin Management Plans started late due to the perceived need to reach a political agreement on objectives and measures. This agreement on "Green Growth" was reached in April 2009, after which the draft plans were elaborated incorporating the measures agreed upon politically. Meanwhile the legal basis

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[178] See also Lasse Baaner, "Programmes of Measures Under the Water Framework Directive - A Comparative case study," *Nordisk miljørättslig tidsskrift / Nordic Environmental Law Journal* 2011, no. 1 (January 2011): 31–51.
[179] Naturstyrelsen, *Vandplan - Hovedvandopland Odense Fjord*, 54.
[180] Miljøstyrelsen, *Vandplaners betydning for husdyrgodkendelser*, n.d.
[181] See also European Commission, *Report from the Commission to the European Parliament and the Counsil on the Implementation of the Water Framework Directive (2000/60/EC)*, 7.

for the new measures was established through new and adjusted legislation (see section 2.3.3). Thus, this approach resulted in quite significant delays.

During the consultation of the draft plans, written contributions came from individuals, business organizations, environmental organizations, agricultural counseling centres and public authorities. More than 4200 consultation responses were received in the main consultation, and more 1700 responses were received in a supplementary consultation.[182] Meetings with municipalities, regions and governmental institutions were also organized.

The contributions have in several cases led to the reassessment regarding discharges, water body conditions, proposed actions etc., which further led to adjustments in the final plans.[183] This process is explicitly recognized as one of the main strengths in the Danish river basin management planning.[184]

The River Basin Management Plans that are the core of the Danish water management system state that they account for the objectives of the Baltic Sea (see section 2.2.6). The River Basin Management Plans have also, explicitly in the preparation of the Marine Strategy by the Ministry of Environment, been regarded as important tools for realizing the strategy in particular as regards land-based pollution.[185]

The supplementary measures laid down in the River Basin Management Plans and Programmes of Measures to reach the objectives of coastal waters and the Baltic Sea as reflected in the Water Framework Directive. The Marine Strategy Directive and HELCOM – include:[186]

- Tightening of the nitrogen norms for selected crops
- Ban on cultivation tillage during certain periods
- Extended use of catch crops (140,000 ha)
- Cultivation-free buffer zones (10 m) along rivers and streams
- Reestablishment of wetlands

[182] Se section 2.3.1 and also Ibid., 8.
[183] Ibid., 9.
[184] Ibid., 4.
[185] Danish Ministery of the Environments Nature Agency, *The Danish Marine Strategy Good Environmental Status , Targets and Indicators [Consultation Draft]*, 22, 30.
[186] Natur- og Landbrugskommissionen, *Natur- og Landbrugskommissionens statusrapport*, 330.

In addition to the above targets and measures, the Government has committed to preparing a new plan for managing the reduction of the remaining 10,000 tonnes of nitrogen emissions estimated as necessary for realising the environmental objectives for the coastal waters (see further in section 2.3.3).

The measures in the River Basin Management Plans are implemented by amendment of existing and development of new legislation. In addition, the River Basin Management Plans include the set of Administrative Guidelines that shall be taken into account when the authorities exercise their powers given in the legislation - e.g. issuing wastewater permits, environmental permits etc.[187]

The measures that aim at reducing the amount of nitrogen leaching from agriculture are primarily established to achieve the environmental objectives of the coastal waters (see section 1.2). The main issue in the river basin management planning has been how to reduce the nitrogen leaching from agriculture in order to achieve the environmental objectives of the Danish coastal waters (see section 2.3.2).

Most of the supplementary measures have been adopted by legislation as binding requirements, e.g. the buffer zones. The 140.000 ha of additional catch crops were also supposed to have entered into effect in 2013, but have now been postponed as a result of the decision by the Nature and Environment Appeals Board declaring the River Basin Management Plans invalid.[188]

## 5.3 Ecosystems Approach and Water Management

The environmental objectives are reflected in the regulatory measures through the process of River Basin Management Planning according to the Water Framework Directive. As explained above, specific regulatory measures have been agreed upon politically and then incorporated into the River Basin Management Plans. The River Basin Management Plans – and later the Municipal Action Plans – specify where and how the measures shall be applied. This includes mandatory requirements as well as voluntary measures such as agreements on wetland restoration, less intensive cultivation etc.

[187] See By- og Landskabsstyrelsen, "Hvordan læses en vandplan?," 3.
[188] Miljøministeriet Departementet, "Vandplanernes status er afklaret. Pressemddelelse 14. januar 2013.", 2014.

The environmental objectives are not enforced in the sense that individuals can be held responsible for actions compromising the objectives. However, the operationalization of the environmental objectives through mandatory requirements by law, e.g. requirements of buffer zones along rivers and lakes, are enforceable upon individuals. Furthermore, the ecological objectives and standards to some extent form a binding basis for the issuance of individual permits and are in that sense translated into binding and enforceable conditions as part of the permit systems. As regards the voluntary measures, the authorities are under a legal obligation to ensure that the measures are made operational and there exists a legal basis to expropriate land to ensure e.g. restoration of wetlands.

## 5.4 Concluding and Summarising Remarks

The Danish water management system has, for several years, had a strong focus on the reduction and management of nutrients. The general perception is that the Danish management system of nutrients is founded on strategic environmental planning carried out at national level as well as necessary legislative initiatives at Parliament and government level.[189] This study confirms the general picture. This includes the adoption at national level of mandatory measures aimed at achieving specified reduction targets. This approach has influenced the implementation of the Water Framework Directive through the Green Growth Agreement. The Danish River Basin Management Plans will thus be made operational through mandatory legislative requirements as well as guidelines for the administration of e.g. wastewater and environmental permits. While the latter may to some extent reflect an ecosystem approach, the general mandatory measures are not necessarily linked to the sensitivity of individual water bodies, but rather to the overall reduction target. This may turn out to be a weakness in the Danish water management system as experience has shown that general reduction targets can be met without actually achieving the desired improvements in the aquatic environment.

Furthermore, the Danish river basin management planning process has been fraught with difficulties – not least due to the political involvement and the following delays. While stakeholder involvement is

[189] Se also example Ærtebjerg, Andersen, and Hansen, *Nutrients and Eutrophication in Danish Marine Waters*, 86–87.

a prominent feature in the planning process, it has in practice turned out to be quite controversial and the real influence may have been limited. Strong criticism finally resulted in the River Basin Management Plans being declared invalid on procedural grounds by the Nature and Environment Appeals Board. The Ministry of the Environment is now preparing for a new consultation of adjusted plans and the Minister for the Environment has launched initiatives to improve stakeholder involvement in the next river basin management planning phase.

# 6 Conclusion

The Danish legal system provides the background for a quite detailed and to some extent also strict environmental regulation of nutrient pollution from agricultural as well as other sources. The strong political focus on nutrient pollution of surface water as well as groundwater since the mid-80'ies has led to the adoption of several aquatic action plans stipulating reduction targets and identifying the necessary measures to achieve those reduction targets. The original reduction target of 50% reduction of the nitrogen load from agriculture compared to the mid-80'ies was met in 2003. However, the expected improvements of the aquatic environment have not yet been achieved – possibly due to a significant time-lag. Nevertheless, new reduction targets have been established and additional measures are being implemented as part of the implementation of the Water Framework Directive. At the moment possible ways to move forward are discussed by a so-called Nature and Agriculture Committee. The Committee will deliver a set of recommendations in Spring 2013.

While subject to a strong political focus and fairly ambitious reduction targets and measures, it can be discussed to what extent the Danish regulation reflects an ecosystem approach. It may be argued that the continued adjustment of targets and measures based on monitoring results reflect an adaptive management approach at a more strategic national policy level. Nevertheless, the measures have mainly had a more general character and their application has not been dependent upon the environmental conditions, objectives and quality standards of specific water bodies or ecosystem. There is on the other hand a fairly strong regulatory tradition for linking environmental planning – formerly regional planning guidelines – with the administration of individual permits, e.g. wastewater permits and environmental permits. This has been developed under the influence of EU environmental law including the Water Framework Directive, the Habitats Directive and the IPPC (now IE) Directive. A clear example is the environmental permit system for livestock installations under which a set of standard-

ized, but differentiated norms have been developed to accommodate the sensitivity of in particular (aquatic) Natura 2000 sites.

The implementation of the Water Framework Directive may to some extent have supported the adoption of an ecosystem approach through the river basin management process – at least that was the original idea. Yet, the continued reliance on new overall reduction targets and mainly general measures as reflected in the Green Growth Agreement only to a limited extent reflect an ecosystem approach in which the environmental objectives and quality standards of individual water bodies determine the measures to be adopted. Furthermore, the strong focus on new additional measures has created some uncertainty about the legal effect of the environmental objectives and quality standards. A key question is whether only the measures stipulated in the River Basin Management Plans must be implemented or whether the environmental objectives are binding in the administration of environmental law in general as stipulated in the Act on Environmental Objectives.

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# Danish Legislation

| Translated name | Danish nickname | Official Danish name |
|---|---|---|
| Act on Buffer Zones along Streams and Lakes | Randzoneloven | Lov nr. 591 af 14/06/2011 om randzoner. |
| Act on Charge of Nitrogen Content in Fertilizers | Kvælstofafgiftsloven | Lov nr. 418 af 26/06/1998 om afgift af kvælstof indeholdt i gødninger m.m |
| Act on Environmental Assessment | Miljøvurderingsloven | Bekendtgørelse nr. 936 af 24/09/2009 af lov om miljøvurdering af planer og programmer |
| Act on Environmental Damage | Miljøskadeloven | |
| Act on Environmental Permits for Livestock Installations | Husdyrmiljøloven | Bekendtgørelse nr. 1486 af 04/12/2009 af lov om miljøgodkendelse m.v. af husdyrbrug |
| Act on Environmental Protection | Miljøbeskyttelsesloven | Bekendtgørelse nr. 879 af 26/06/2010 af lov om miljøbeskyttelse |
| Act on Environmental Objectives | Miljømålsloven | Bekendtgørelse nr. 932 af 24/09/2009af lov om miljømål m.v. for vandforekomster og internationale naturbeskyttelsesområder |
| Act on Fertilizer Use and | Gødskningsloven | Bekendtgørelse nr. 415 af 03/05/2011 af lov om jord- |

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| Plant Cover | | brugets anvendelse af gødning og om plantedække |
| Act on Fisheries | Fiskeriloven | Bekendtgørelse nr. 978 af 26/09/2008 af lov om fiskeri og fiskeopdræt |
| Act on Forests | Skovloven | Bekendtgørelse nr. 945 af 24/09/2009 af lov om skove |
| Act on Marine Strategy | Havstrategiloven | Lov nr. 522 af 26/05/2010 om havstrategi |
| Act on Mineral Resources | Råstofloven | Bekendtgørelse nr. 950 af 24/09/2009 af lov om råstoffer |
| Act on Nature Protection | Naturbeskyttelsesloven | Bekendtgørelse nr. 933 af 24/09/2009 af lov om naturbeskyttelse |
| Act on Nature- and Environment Appeals Board | - | Lov nr. 483 af 11/05/2010 om Natur- og Miljøklagenævnet |
| Act on National Parks | Nationalparkloven | Lov nr. 533 af 06/06/2007om nationalparker |
| Act on Rural Development | Landdistriktsloven | Lov nr. 316 af 31/03/2007 om udvikling af landdistrikterne |
| Act on Polluted Soil | Jordforureningsloven | Bekendtgørelse nr. 1427 af 04/12/2009 af lov om forurenet jord |
| Act on Planning | Planloven | Bekendtgørelse nr. 937 af 24/09/2009 af lov om planlægning |
| Act on Marine Environment | Havmiljøloven | Bekendtgørelse nr. 929 af 24/09/2009 af lov om beskyttelse af havmiljøet |
| Act on Tax on Wastewater | Spildevandsafgiftsloven | Bekendtgørelse nr. nr. 636 af 21/08/1998 af lov om afgift af spildevand |
| Act on Underground Resources | Undergrundsloven | Bekendtgørelse nr. 960 af 13/09/2011 af lov om anvendelse af Danmarks under- |

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| Act on Wastewater Payment | Betalingsloven | Bekendtgørelse nr. 633 af 07/06/2010 af lov om betalingsregler for spildevandsforsyningsselskaber |
| Act on Watercourses | Vandløbsloven | Bekendtgørelse nr. 927 af 24/09/2009 af lov om vandløb |
| Act on Water Sector | Vandsektorloven | Lov nr. 469 af 12/06/2009 om vandsektorens organisering og økonomiske forhold |
| Act on Water Supply | Vandforsyningsloven | Bekendtgørelse nr. 635 af 07/06/2010 af lov om vandforsyning m.v. |
| Statutory Order of Nitrogen Forecast | Kvælstofprognosen | Bekendtgørelse nr. 246 af 16/03/2012 om kvælstofprognosen for planperioden 2011/2012. |
| Statutory Order on Approval Scheme for small Wastewater Treatment Installations | Typegodkendelsesbekendtgørelsen | Bekendtgørelse nr. 1444 af 11/12/2007 om typegodkendelsesordning for minirenseanlæg |
| Statutory Order on Environmental Quality Standards for Watercourses, Lakes and Marine Waters | - | Bekendtgørelse nr. 1022 af 25/08/2010 om miljøkvalitetskrav for vandområder og krav til udledning af forurenende stoffer til vandløb, søer eller havet. |
| Statutory Order on Internationally Protected Nature Sites | Habitatbekendtgørelsen | Bekendtgørelse 408 af 01/05/2007 om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af |

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| Statutory Order on Livestock, Manure and Silage | Husdyrgødnings-bekendtgørelsen | Bekendtgørelse nr. 764 af 28/06/2012 om erhvervs-mæssigt dyrehold, husdyr-gødning, ensilage m.v. |
| Statutory Order on Permits for Industrial Installations | Godkendelses-bekendtgørelsen | Bekendtgørelse nr. 1454 af 20/12/2012 om godkendelse af listevirksomhed |
| Statutory Order on Permits for Livestock Installations | Husdyrgodkendelses-bekendtgørelsen | Bekendtgørelse nr. 294 af 31/03/2009 om tilladelse og godkendelse m.v. af husdyr-brug |
| Statutory Order on Control of Storage Fa-cilities for Slurry | Beholderkontrol-bekendtgørelsen | Bekendtgørelse nr. 1322 af 14/12/2012 om kontrol af beholdere til opbevaring af flydende husdyrgødning og ensilagesaft |
| Statutory Order on Use of Fertilizer and Plant Cover | Gødsknings-bekendtgørelsen | Bekendtgørelse nr. 845 af 12/07/2011 om jordbrugets anvendelse af gødning i planperioden 2011/2012 og om plantedække |
| Statutory Order on Wastewater Permits | Spildevands-bekendtgørelsen | Bekendtgørelse nr. 1448 af 11/12/2007 om spildevands-tilladelser mv. efter miljøbe-skyttelseslovens kapitel 3 og 4 |
| The Danish Constitution | Grundloven | Danmarks Riges Grundlov |

# Plans, programmes and political agreements

| Translated name | Danish nickname | Official Danish name |
|---|---|---|
| Action Plan for Sustainable Agriculture | Handlingsplan for bæredygtigt landbrug | Handlingsplan for en bæredygtig udvikling i landbruget |
| Aquatic Action Plan I | VMP I | Vandmiljøplan I |
| Aquatic Action Plan II | VMP II | Vandmiljøplan II |
| Aquatic Action Plan III | VMP III | Vandmiljøplan III |
| Green Growth | Grøn Vækst | Aftale mellem Regeringen og Dansk Folkeparti om Grøn Vækst |
| NPO Action Plan | NPO-handlingsplanen | Folketingets beslutning af 31. maj 1985 om nedbringelse af forurening med næringssalte og organisk stof |
| River Basin Management Plan | Vandplan | Vandplan for hovedvandopland |
| Wastewater Plan | - | Spildevandsplan |

# Translations and acronyms

| Translated name | Danish nick-name / acronym | Official Danish name |
|---|---|---|
| Environmental Board on Agricultural Technology | MELT | Miljøstyrelsens ekspertudvalg vedrørende miljøeffektiv landbrugsteknologi |
| The Kattegat | - | Kattegat |
| Administrative Guidelines | Retningslinjer | Retningslinjer for udøvelsen af beføjelser i medfør af lovgivningen. |
| Annual Nitrogen Forecast | - | Kvælstofprognosen |
| Consolidated Act | LBK | Lovbekendtgørelse |
| Danish People's Party | DF | Dansk Folkeparti |
| Environmental Protection Agency | MST | Miljøstyrelsen |
| Environmental Protection Agency's verification system for eco-efficient technology | VERA | Miljøstyrelsens verifikationsordning for miljøeffektiv teknologi |
| House and Building Register | BBR | Bygge og Boligregistret |
| Livestock Units | DE | Dyreenheder |
| Livestock Balance | - | Harmonikrav |
| Local Government, Denmark | KL | Kommunernes Landsforening |
| National Agro Business Agency | NaturErhverv | NaturErhvervstyrelsen |
| Nature Agency | NST | Naturstyrelsen |
| Nature and Agriculture Committee | Natur- og Landbrugs-kommissionen | Natur- og Landbrugskommissionen |

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| Nature and Environment Appeals Board | NMKN | Natur- og Miljøklagenævnet |
| Nitrate Classes | - | Nitratklasser |
| Nitrogen Committee | - | Kvælstofarbejdsgruppen |
| Nitrogen Norm Committee | Kvælstofudvalget | Udvalg vedrørende kvælstofnormer, -prognoser og kvælstof i husdyrgødning |
| Nitrogen Norms | - | Kvælstofnormer |
| Ministry of Environment | MIM | Miljøministeriet |
| Ministry of Food, Agricultural and Fisheries | FVM | Ministeriet for Fødevarer, Landbrug og Fiskeri |
| Municipal Water Action Plans | Vandhandleplaner | Kommunale vandhandleplaner |
| Protection levels | - | Beskyttelsesniveauer |
| River Basin | Vandopland | Hovedvandopland |
| Statutory Order | Bek. | Bekendtgørelse |
| The Baltic Sea | - | Østersøen |
| The Belts | - | Bælthavet |
| The Parliaments Environmental Committee | Miljøudvalget | Folketingets Miljøudvalg |
| The Parliament | - | Folketinget |
| The Supreme Court | H | Højesteret |
| Treatment Classes | - | Renseklasser |
| Western High Court | V | Vestre Landsret |
| Eastern High Court | Ø | Østre Landsret |
| Wastewater Committee | - | Spildevandsudvalget |